# 日本古生物学會
# 報告・紀事

# Transactions and Proceedings
# of the
# Palaeontological Society of Japan

New Series　　No. 38

日本古生物学会

Palaeontological Society of Japan
June 1, 1960

# CONTENTS

TRANSACTIONS

Page

380. Permian Corals from the Taishaku District, Hiroshima Prefecture, Japan. .............................................. Tsuruo YOKOYAMA 239
381. On the Miocene Pectinidae from the Environs of Sendai; Part 16, *Pecten kimurai* YOKOYAMA and *Palliolum* cf. *peckhami* (GABB). ................ .............................................. Koichiro MASUDA 249
382. Molluscan Fossils from Tungyüping in the Penghu Islands, Taiwan..... ..............................Ichiro HAYASAKA and Shozo HAYASAKA 263
383. A Note on *Neoburmesia*, a peculiar Jurassic Pelecypod, with Description of Mytilids and Myacids from the Upper Jurassic Soma Group in Japan..........................................Minoru TAMURA 275

Short Note

6. Two Jurassic Pelecypods from West Thailand ...........Itaru HAYAMI 284

President: Teiichi KOBAYASHI
Councillors: Kiyoshi ASANO, Riuji ENDO (Publication), Seido ENDO, Haruyoshi FUJIMOTO (Treasurer), Shoshiro HANZAWA, Kotora HATAI, Ichiro HAYASAKA, Kazuo HUZIOKA, Nobuo IKEBE, Jiro MAKIYAMA, Tatsuro MATSUMOTO, Masao MINATO Tokio SHIKAMA (General Affairs), Fuyuji TAKAI (Editor), Ryuzo TORIYAMA
Secretary: Tetsuro HANAI
Assistant Secretary: Takeo ICHIKAWA

All Communications relating to this Journal should be addressed to the
PALAEONTOLOGICAL SOCIETY OF JAPAN
Geological Institute, Faculty of Science, University of Tokyo, Japan

Trans. Proc. Palaeont. Soc. Japan, N. S., No. 38, pp. 239-248, pls. 27-28, June 1, 1960

# 380. PERMIAN CORALS FROM THE TAISHAKU DISTRICT, HIROSHIMA PREFECTURE, JAPAN*

TSURUO YOKOYAMA

Institute of Geology and Mineralogy, Hiroshima University

広島県帝釈地方産二畳系珊瑚類：従来，この地方の二畳系珊瑚類は，ほとんど *Pseudoschwagerina* 帯から知られていたが，新たに同帯および *Lepidolina* 帯から，珊瑚化石動物群についての知識を得た。前者は *Stylidophyllum* で特徴づけられ，後者は *Waagenophyllum* で代表される。それにもとづき，この地方の二畳系珊瑚化石帯二帯を設定し，*Waagenophyllum* 属 4 種，*Huangia* 属 3 種，*Stylidophyllum* 属 2 種，および *Lophophyllidium* 属 1 種を記載した。

横 山 鶴 雄

## Introduction and Acknowledgements

This paper gives the results of investigation on corals obtained from the Permian limestones of the Taishaku district.

The occurrence of a number of species of corals has hitherto been reported from the *Pseudoschwagerina* zone and other zones of the district (YOSHINO, 1937; HUZIMOTO, 1944; MINATO, 1955; and AKAGI, 1958): but none of the species has been described. Among the Permian corals, 10 species in 5 genera are distinguished by the present writer from the *Pseudoschwagerina* and *Lepidolina* zones of the district.

The writer wishes to express his hearty thanks to Dr. Ichiro HAYASAKA, President of Shimane University, for his kindness in reading the manuscript and for his valuable guidance on the study of corals. He also acknowledges the helpful encouragements of Professor Sotoji IMAMURA of Hiroshima University.

## Previous works

Many authors have noted the occurrence of fossil corals in the Misaki limestone and its equivalent, central part of the Taishaku district, and in some limestones exposed at some other parts of the district, but those fossils have not been investigated paleontologically.

YOSHINO (1937) reported several coral species from the district, of which *Waagenophyllum* sp., *Clisiophyllum* sp. and *Wentzelella* sp. are of Permian age. HUZIMOTO (1944), in his Sakmarian limestone, recorded the occurrence of *Akiyosiphyllum* cf. *stylophorum* YABE et SUGIYAMA and *Clisiophyllum* sp. from his loc. no. 2, about 200 m. south of the present writer's locality of Misaka, in association with *Pseudofusulina kraffti*, *P. krotowi*, *P. tshernyschewi*, *Schwagerina* sp. and others. By MINATO (1955, p. 108), *Waagenophyllum akagoensis* OZAWA from Shiramizu, near the junction of Taishaku-gawa and its tributary Zenbutsuji-dani, was presumed to be of the Uppermost *Pseudoschwagerina* (?) or

---

* Received Feb. 28, 1959; read at the Annual Meeting of the Society at Hiroshima, Feb. 14, 1959.

*Parafusulina* zone. Recently, AKAGI (1958) also recorded the occurrence of *Stylidophyllum* n. sp. and *Huangia* sp. from his *Pseudoschwagerina* zone in the Miharano area, some 2 km. east of Misaka.

In this way, the coral species of the *Pseudoschwagerina* zone have been made quite well known from the district.

### Materials dealt with in this paper

Through extensive reconnaissance of the district the present writer has hitherto obtained the following species:

1) from greyish limestone of the Misaka area, about 200 m. north of the Misaka Primary School,

*Stylidophyllum yokoyamai tertioseptatum*, subsp. nov.
*S. eguchii*, sp. nov.
*Huangia misakensis*, sp. nov.
*H.* spp. A and B
*Lophophyllidium* sp.

in association with abundant fusulinids, including such genera as *Pseudofusulina*, *Pseudoschwagerina* and *Schwagerina*, as well as *Palaeoaplysina laminaeformis* KROTOW*.

2) from the valley of "Ippaimizu", a famous "geyser" of the district, about 1 km. southwest of Tôjô-town,

*Waagenophyllum* ? sp. indet.

with such fusulinids as *Yabeina* spp., *Sumatrina annae*, *Codonofusiella* sp., etc., in a limestone-lens.

3) in a pebble in the limestone-conglomerate of the *Neoschwagerina* zone exposed at about 100 m. west of Nagano,

*Corwenia* ? sp.

4) from the massive grey or dark-grey limestone of the Yasumoto Formation*, which contains abundant fusulinids characterizing the *Lepidolina* zone, such as *Lepidolina*, *Yabeina*, *Codonofusiella*, etc.,

*Waagenophyllum longiseptatum*, sp. nov.
*W.* cfr. *akasakensis* (YABE)
*W.* sp.

Many calcareous algae also occur richly in the formation.

Of these coral species, *Stylidophyllum eguchii*, sp. nov. is a new form having broader dissepimentarium and rather regular direction of longer axis of elliptical columella; and *S. yokoyamai tertioseptatum*, subsp. nov., closely resembles, and may probably be conspecific with *Lonsdaleia* (? *Waagenophyllum*) *yokoyamai* OZAWA 1928 [=*Stylidophyllum yokoyamai* (OZAWA), MINATO 1955] from the "Uralian"-Lower Permian** at Kaerimizu in Akiyoshi district. *Huangia misakensis*, sp. nov. has a more densely constructed corallite, though unfortunately it is preserved unsatisfactorily in a fragmental material, and is a remarkable species in comparison with the species in the coral faunas of other districts.

Although no closer similarity is found among them, the *Stylidophyllum* faunule associated with the *Pseudoschwagerina* faunule of the district apparently corresponds to that of the *Pseudoschwagerina* zone of other districts, to the Zone of *Stylidophyllum volzi* of Southern China (HUANG, 1932), to the *Huangia hasimotoi-Lophophyllidium suetomii* zone, according to MINATO (1955, Table 1), and also to that of the coral faunas which were recognized by Huzimoto* and Akagi.

---

* A reef-building Hydrozoa (?). See H. YABE (1949): Two Permian Fossils from China and Japan of uncertain Affinity. *Proc. Japan Acad., Vol. 25, No. 6*, pp. 215-218, Figs. 1-6.

* The detail of the formation will be described by the writer in his future paper.

** It is now generally accepted OZAWA's CPg should represent the *Parafusulina* zone, as was pointed out by MINATO (1955, p. 134).

Species of *Waagenophyllum* are found abundantly in the upper half of the *Lepidolina*-limestone of the Yasumoto Formation, and they generally have more irregular coralla than those known previously: especially the former is rather dendroid in growth than phaceloid as in the latter, although corallites are often found isolated in the rock. Specimens allied in form to type-species of the genus, *Waagenophyllum indicum*, have not been found in this formation. In point of being in association with *Lepidolina* faunule the occurrence in the Yasumoto fauna much more closely resembles the Kuma fauna (Kanmera, 1953) as well as the Kitakami fauna (Minato and others, 1954) rather than the coral faunas in either the *Yabeina* zone (s.l.) of Akiyoshi (Ozawa, 1925; revised by Minato, 1955) or of Akasaka and neighbourhood (Yabe and others, cfr. Minato, 1955, p. 32).

The *Waagenophyllum*- and *Stylidophyllum*-faunas occur independently from each other. Stratigraphical relations between them is tabulated as follows in reference to the fusulinid zones. Taking into consideration this stratigraphical relationship, the writer is led to distinguish two coral zones in the Taishaku district; that is, the *Stylidophyllum eguchii* and the *Waagenophyllum longiseptatum* zone, corresponding to the *Pseudoschwagerina* zone and the *Lepidolina* zone, respectively.

Stratigraphic summary of the distribution of Permian corals.

| Fusulinid zones | Coral zones | Coral species |
|---|---|---|
| *Lepidolina* | *Waagenophyllum longiseptatum* | *Waagenophyllum* cfr. *akasakensis*, *W. longiseptatum*, sp. nov., *W.* sp. |
| *Yabeina* | | *Waagenophyllum* ? sp. indet. |
| *Neoschwagerina* | | |
| *Parafusulina* | | |
| *Pseudoschwagerina* | *Stylidophyllum eguchii* | *Stylidophyllum eguchii*, sp. nov., *S. yokoyamai tertioseptatum*, subsp. nov., *Huangia misakensis*, sp. nov., *H.* spp., *Lophophyllidium* sp. |

## Description of species

### Family Clisiophyllidae Nicholson and Thomson

### Genus *Waagenophyllum* Hayasaka, 1924

### *Waagenophyllum longiseptatum*, sp. nov.

Plate 28, Figures 3a–e

*Description:*—Corallum compound, fasciculated dendroidally and more loosely or irregularly, corallites being flexuous. Corallites cylindrical with an average diameter of 7 mm.; irregular but rather circular in transverse section, and more regularly constructed internally. Wall rather thick. Major and minor septa in alternation; all of them thin but usually strengthened with stereoplasmicdeposits and slightly thickened toward the wall, and conspicuously sinuous in the peripheral area where stereozone is widely developed with a width of about half the length of the major septa: the former one slightly stronger than the latter throughout the growth; 26 in number and about 2/3 of the diameter of corallite in length, while minor ones are about 3/4 of the major ones; sometimes bending at the inner ends but almost reach to the outer margin of columella, but never connected with septal lamellae. Tertiary septa quite obscured. Dissepiments less numerous, arranged concentrically. Columella elliptical, its structure being " eccentric " in transverse section, constructed rather thickly with axial tabellae, septal lamellae and indistinct median plate, occupying about 1/3 of diameter of corallite.

---

* Of his species, *Akiyosiphyllum stylophorum* is ascribed to the *Yabeina* zone by Minato (*op. cit.*, p. 168).

In the longitudinal section, coarse dissepiments are arranged irregularly, and inclined steeply at the periphery of columella facing their convex sides toward inside. Stereoplasmic deposits fibrous in appearance. Columella composed of gently arched axial-tabellae and numerous, minute septal lamellae.

*Comparison:*—This species may be more advanced form of the genus. Comparing with *Waagenophyllum akasakensis* (YABE), the species now in concern is distinguishable in the following characters of corallites, from the original material of *W. akasakensis:* number of septa and their more regular development, stereozone and structure of columella; degree of attachment of septa with columella, and of development of dissepiments in immature corallites from that illustrated by MINATO (1955, Pl. 37, Figs. 6a-e); and also the corallum being more loosely fasciculate and irregularly bent than the material described by OZAWA (1925, Pl. 14, Figs. 5 and 6).

*Occurrence:*—The *Waagenophyllum longiseptatum* zone of the Yasumoto Formation, central part of the Taishaku plateau, Tôjô-chô, Hiba-gun, Hiroshima Prefecture. (*Holotype:*—IGSH Y. T. No. 3)

### *Waagenophyllum* cfr. *akasakensis* (YABE)

Plate 28, Figures 1a-d and 2a-d

1909. *Lonsdaleia akasakensis*, YABE, *Jour. Geol. Soc. Tokyo, Vol. 9, No. 104*, pp. 4-5, fig. 3.
1915. *Lonsdaleia* (*Waagenella*) *akasakensis*, YABE and HAYASAKA, *Jour. Geol. Soc. Tokyo, Vol. 22*, pp. 100-104.
1925. *Waagenophyllum akasakensis*, OZAWA, *Jour. Coll. Sci. Tokyo Imp. Univ., Vol. 45, Art. 6*, p. 75, pl. 14, figs. 5, 6.
1930. *Waagenophyllum akasakensis*, SMITH, *Jour. Pal., Vol. 9*, p. 36.
1955. *Waagenophyllum akasakensis*, MINATO, *Jour. Fac. Sci. Hokkaido Univ., Ser. IV, Vol. IX, No. 2*, pp. 104-105, pl. 37, figs. 6a-e, 7.

*Description:*—Corallum fasciculate, with cylindrical corallites that are irregular in transverse sections. Wall rather thick, strengthened with stereoplasmic deposits: the other structure also are thickened in the same way. Septa in two orders, major and minor in alternation; both somewhat flexuous and thinning towards the center: the former 22 in number in mature stage of corallites, and not connected with columella; about 1/3 of calicular diameter in length: minor ones about 1/2 or 2/3 of major ones: dissepiments numerous: stereozone distinct. Columella rather elliptical in outline and more thickly constructed with septal lamellae and axial tabellae, with an indistinct median plate.

*Comparison:*—Compared with *Waagenophyllum akasakensis* (YABE) in transverse section, the present specimens coincide with the former in major features. But it has more irregular corallites that are roughly fasciculate. In comparison with *W. akagoensis* Ozawa, the species now in concern has relatively longer minor septa.

*Occurrence:*—The *Waagenophyllum longiseptatum* zone of the Yasumoto Formation.

### *Waagenophyllum* sp.

Plate 28, Figures 4a–d;
Plate 28, Figure 6

*Description:*—Corallum compound, irregularly and roughly fasciculate. Corallites rather irregular in transverse section, with the calicular diameter attaining about 4–5 mm. Wall thin. Septa in two orders, major and minor in alternation; all being thin and flexuous. Major septa 21–22 in number with the length 1/3 of calicular diameter; minor ones about 2/3, sometimes 3/4 of major ones. No major septa reach to columella, though the stereoplasms grow irregularly and inwardly from the inner ends of some major ones connecting with columella. Dissepiments numerous; in immature stage of corallite, thicker stereozone develops, having the thickness as wide as the minor septa are long, where a few dissepiments occur. Columella rather thick, but irregularly constructed with axial tabellae, septal lamellae and obscure median-plate; it measures about 1/4 of calicular diameter. The ratios of columella to corallites are very variable according to growth stages of corallites.

*Comparison:*—Although the specimens show the same features characteristic of the type species, *W. iudicum*, that is, in calicular diameter, septal nature, etc., this material is not identical with the latter. The following are the differences between them:

1) Major septa of the present species do not reach to the columellum which is more thickly constructed than in the type species; 2) Corallum of the former is formed of a less number of corallites that are more irregularly or dendroidally fasciculated than those of the latter. *Waagenophyllum wengchengense* Huang and *W. akagoensis* (Ozawa), obtained from the Permian of Southern China (Huang, 1932) and from Akiyoshi (Ozawa, 1925), respectively, are the other allies, but the present species has smaller corallites and thicker stereozone which develop more thickly in early stage of growth. The major septa of the species now in concern, furthermore, are inserted into the center, closely approaching the columella, but in the latter two species the septal ends and columella are a little more widely apart. In comparison with *Waagenophyllum akasakensis* (Yabe), the present form has smaller dimensions and slim inner-structure.

*Occurrence:*—The *Waagenophyllum longiseptatum* zone of the Yasumoto Formation of Taishaku district.

### *Waagenophyllum* ? sp. indet.

There is an imperfect, fragmentary material from the dark limestone-lens of *Yabeina* zone. In an oblique section, two kinds of septa with distinct stereozone are observable. Although it appears an oblique section of the preceding species, its exact nature is uncertain.

*Occurrence:*—*Yabeina* zone (s. l.) of "Ippaimizu", near Tôjô-town.

## Genus *Huangia* Yabe, 1950

### *Huangia misakensis* sp. nov.

Plate 27, Figures 5a–d

*Description:*—The nature of corallum unknown. Corallites irregular in shape and size, 15-18 mm. in diameter. Wall rather thick. Septa in two orders, major and minor in alternation; the former about 30 in number (exact number unknown), reaching almost to the periphery of columella, and strengthened with stereoplasm; minor ones about 1/2 to 1/3 of the former in length and rather weak, but never penetrated into the tabularium which is separated from dense dissepimentarium by the indistinct false inner wall formed of the inner series of vesicles, beyond which minor septa do not protrude. Dissepiments are arranged usually in herringbone pattern but irregular in parts. The width of dissepimentarium attains about 1/2 of radius of corallites, and that of tabularium which is modified by the irregular cut-edges of inclined tabulae, about 1/4, but rather unequal in some parts. Columella irregularly constructed with numerous axial tabellae and septal lamellae: median plate indistinct.

In the longitudinal section, triareal arrangement is shown; dissepimentarium is composed of numerous, fine vesicles inclining gently but steeply inwards. Tabulae rather horizontal but arranged irregularly. Columella made up of numerous, steeply arched tabellae and septal lamellae.

*Comparison:*—This species has more thickly but irregularly constructed corallites. The structure of columella, irregular tabularium and dissepimentarium of this species differ conspicuously from those of *Huangia hasimotoi* (NAGAO and MINATO) from the *Pseudoschwagerina* zone of Kitakami Massif.

*Occurrence:*—The *Stylidophyllum eguchii* zone of Misaka, about 200 m. north of the Misaka Primary School, Tôjô-chô, Hiba-gun, Hiroshima Prefecture. (*Holotype:* IGSH Y. T. No. 4).

### *Huangia* sp. A

Plate 27, Figures 2a and b

*Description:*—A transverse section of a coral. Corallum probably compound, fasciculate. Corallite about 10 mm. in diameter. Wall is of medium thickness, though strengthened with dark materials and almost destroyed. Major septa preserved in about one half part of the corallite, in length being about 1/3 of diameter of corallite, reaching to the the columella but not connected with septal lamellae. Minor septa observable scarcely in the outer parts where coarse dissepiments are found. Tabulae rather numerous. Columella circular in outline with diameter roughly equaling the radius of corallite, composed of distinct median plate, numerous radiated septal lamellae and axial tabellae.

In an offset, a small corallite which appears rather trigonal in outline, a few septa and indistinct axial-structure are recognized.

*Comparison:*—This material is somewhat allied to the type species of the genus, *Huangia chutsingensis* (CHI) from Weiningian (Middle Carboniferous) of Southern China, but has a more closely constructed, circular columellum.

*Occurrence:*—The *Stylidophyllum eguchii* zone of Misaka.

### *Huangia* sp. B

Plate 27, Figure 3

*Description:*—A fragmentary material showing only in a transverse section. Corallite somewhat polygonal in outline, 5 mm. in diameter. Septa in two orders; major septa rather irregular but 2/3 of radius of corallite in length; minor ones very short, alternating with the former, about 1/3 to 1/4. In the preserved half of the corallite, major septa are about 10 in number. Dissepimental zone narrow; and dissepiments less numerous and arranged irregularly with minor septa which never cross the inner surface of the zone. Columella constructed very loosely or irregularly with septal lamellae and axial tabellae; median plate indistinct.

*Comparison:*—This species quite differs from the preceding one in the internal structure, especially in construction of columella and tabularium.

*Occurrence:*—The *Stylidophyllum eguchii* zone of Misaka.

### Genus *Stylidophyllum* Fromentel, 1861

### *Stylidophyllum eguchii*, sp. nov.

Plate 27, Figures 4a and b

*Description:*—Corallum compound, cerioid; outer shape unknown. Corallites more regular in shape and size; polygonal in transverse section. Wall thin but strongly thickened. Dissepimental zone broad, filled up with numerous, fine but partly coarse vesicles with septal ridges in part. Septa of two orders, longer and shorter, in alternation; extend back into dissepimental area and connected with septal ridges inside the wall especially where the dissepimentarium is narrower. Longer septa 21 in number and usually not united with columella; uniformly thin but rather lophaloidal in the calicular part. Shorter ones about 1/2 to 2/3 as long as the former. Columella elliptical in shape, composed of median plate, septal lamellae and axial tabellae: the longer axes or the median plates all point to the same direction. Septal lamellae and axial tabellae are less numerous for a species of *Stylidophyllum* in general.

In the longitudinal section preserved unsatisfactorily, all the parts of corallite structure are strongly destroyed by recrystallization of calcite fibers. The gently inclined coarse dissepiments, the horizontal tabulae and the axial-tabellae are in part free from the secondary recrystallization, to preserve their original features.

*Remarks:*—Unfortunately the material is ill-preserved, especially in the longitudinal section. The hight of corallum attains about 10 mm., being buried in a limestone block. The species has a more regular structure in comparison with the Chinese Stylidophyllids described by Huang (1932). In the features mentioned above, the present species is more approximate to the several Iranian species (Douglas, 1936), but it has the finer dissepimentarium, larger tabularium and elliptical columella, not to speak of the peculiar parallelism of orientation of the columellar median plates.

*Occurrence:*—The *Stylidophyllum eguchii* zone of Misaka. (*Holotype:* IGSH Y. T. No. 5).

### *Stylidophyllum yokoyamai tertioseptatum*, subsp. nov.

Plate 27, Figures 1a-c

*Description:*—Corallum compound, massive and cerioid, partly plocoidal. Corallites polygonal, irregular in size. Wall moderate in thickness, strongly thickened by stereoplasmic deposits: so are the septa, septal ridges and other structures. Septa usually of two orders, major and minor in alternation; tertiary ones develop in some parts; all thickened gradually toward the wall. Major septa not united with columella, and 17 in number, about 2/3 of the diameter of corallite in length. Minor ones more irregular in length and development. Interseptal dissepiments arranged in concentric or irregular pattern. Septal ridges inside the wall correspond in position to that of septa. Columella also irregular in shape and size, and composed of distinct a median plate, septal lamellae and axial tabellae. Median plates in some corallites connected with one of the major septa. Septal lamellae and axial tabellae less numerous. Peripheral dissepimental zone rather broad.

In the longitudinal section, columella composed of median plate and conical axial-tabellae. Tabulae horizontal, occupying a narrow zone, numbering about 15 in a distance of 5 mm. Dissepiments rather coarse and less numerous.

*Comparison*:—The species is practically identical with *Stylidophyllum yokoyamai* (OZAWA) in general aspects, only apparently differing in the septal number in mature stage of corallites and in the occasional development of tertiary septa, and also in the simplicity of columellar structure. In point of the geological age, the former younger than the latter which belongs to the *Parafusulina* zone, according to OZAWA.

*Occurrence*:—The *Stylidophyllum eguchii* zone of Misaka. (*Holotype*: IGSH Y. T. No. 6).

### Family Lophophyllidae GRABAU, 1928

### Genus *Lophophyllidium* GRABAU, 1928

### *Lophophyllidium* sp.

Plate 27, Figure 7

*Description*:—Corallite solitary, small with calicular diameter about 8–10 mm. Well rather thick. Septa very thick and tough, counting 20, almost reach to columella excepting minute, doubtful cardinal-one. Minor septa absent. Columella very large, roughly circular or almond-shaped with a cusp directing the head to the presumable cardinal septum; about the same as the radius of corallite in diameter; and made up

---

Explanation of Plate 27

Figures 1a, b and c, *Stylidophyllum yokoyamai tertioseptatum*, subsp. nov.
1a~b, serial transverse sections of the holotype (×2); 1c, longitudinal section (×2); the arrows show the same corallite in both sections.

Figures 2a and b, *Huangia* sp. A.
2a, transverse section of a corallite with a offset one (×3); 2b, longitudinal section (×3).

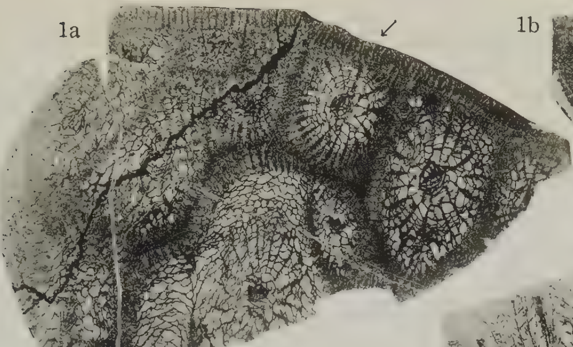
Figure 3, *Huangia* sp. B. transverse section (×7).

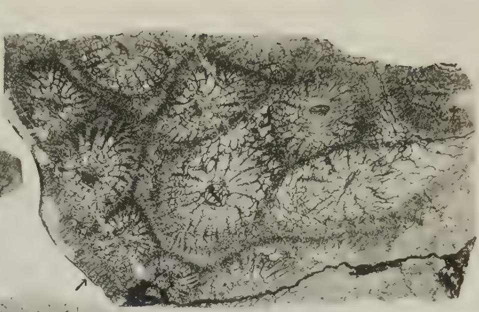
Figures 4a and b, *Stylidophyllum eguchii*, sp. nov.
4a, transverse section (×2); 4b, longitudinal section of the calicular part (×3), drawing through Camera lucida apparatus.

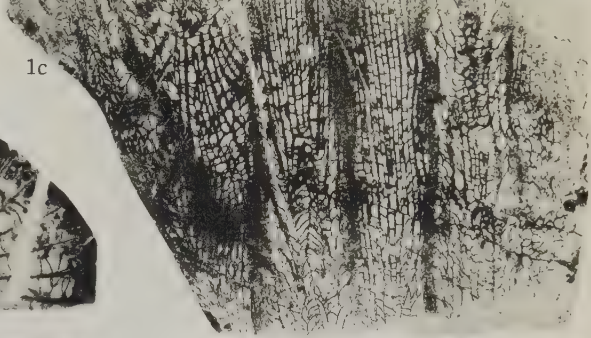
Figures 5a~d, *Huangia misakensis*, sp. nov.
5a~c, serial transverse sections (×2); 5d, longitudinal section (×2).

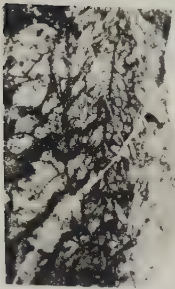
Figure 6, *Waagenophyllum* sp.
Oblique longitudinal section (×5).

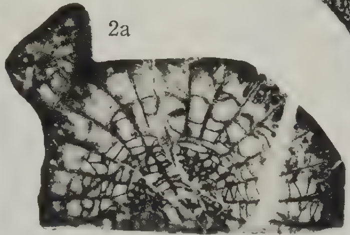
Figure 7, *Lophophyllidium* sp.
Transverse section (×3.5).

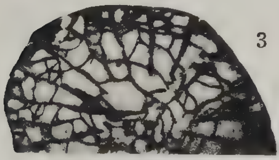

1a

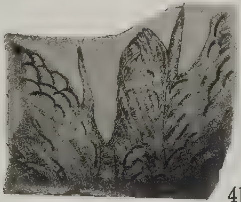

1b

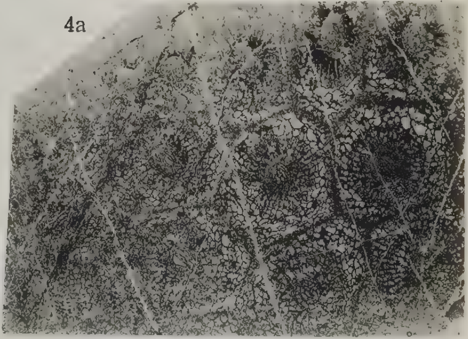

1c

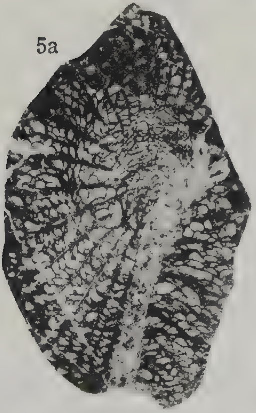

2b

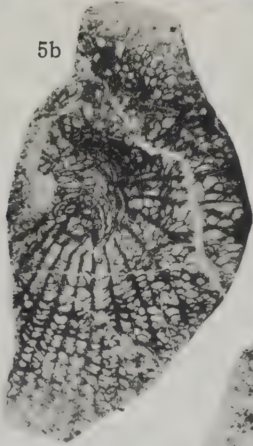

2a

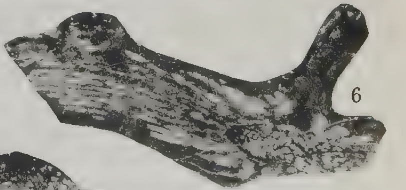

3

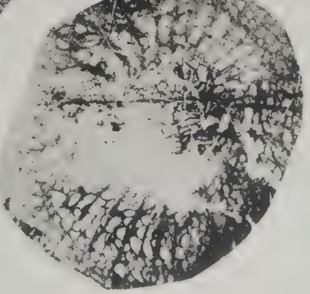

4b

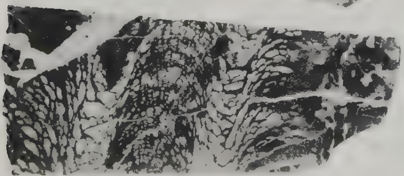

4a

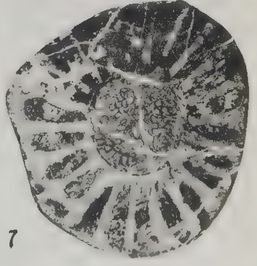

5a


5b


6


5c


5d


7

of numerous, fine vesicular tissues. By higher magnification, the columellum is seen to be composed of axial tabellae, septal lamellae and indistinct median plate or striation connected with the counter septum, as is found clisiophyllid corals.

*Comparison:*—The species may be considered nearly to *Lophophyllum amygdalophylloidea* HUANG [=*Lophophyllidium amygdalophylloidea* (HUANG)] from the Permian of Southern China, in general aspects especially in the nature of columella, but differs from it in septal development; that is, in the Chinese species the tertiary and also quarternary septa develop in the peripheral stereozone, while in the present Japanese one has the less-numerous, tough major septa.

*Occurrence:*—The *Stylidophyllum eguchii* zone of Misaka.

## References

AKAGI, S. (1958): On some Permian *Porifera* from Japan. *Jubilee Publ. in the Commemoration of Prof. H. FUJIMOTO*, p. 66.

CHI, Y. S. (1931): Weiningian (Middle Carboniferous) Corals of China. *Paleont. Sinica, Ser. B, Vol. XII, Fasc. 5.*

DOUGLAS, J. A. (1936): A Permo-Carboniferous fauna from Southwest Persia (Iran). *Palaeont. Indica, N. S., Mem. No. 6.*

FLÜGEL, H. (1955): Zur Paläontologie des anatolischen Paläozoikums IV. Permische Korallen aus dem südanatolischen Taurus. *Neues Jb. Geol. u. Paläontol., Abh., 101, 3*, pp. 293-318, Pls. 33-35.

GERTH, H. (1921): Die Anthozoen der Dyas von Timor. *Paläontologie von Timor IX*, Pls. CXLV-CL.

—— (1937): Permkorallen aus dem östlichen Karakorum und Triaskorallen aus dem Nordwestlichen Himalaya. *Palaeontographica, 88A.*

GRABAU, A. W. (1928): Palaeozoic corals of China, Part. 1, *Palaeontol. Sinica, Ser. B, vol. 2, fasc. 2.*

HAYASAKA, I. (1924): On the fauna of the Anthracolithic limestone of Omi-Mura in the Western part of Echigo. *Sci. Rept. Tohoku Imp. Univ., 2nd ser., vol. VIII, no. 1*, Pls. 1-7.

HERITSCH, F. (1936): Korallen der Moskauer-, Gshel- und Schwagerinen-Stufe der Karnischen Alpen. *Palaeontographica, 88A.*

HUANG, T K. (1932): Permian corals of Southern China. *Palaeontol. Sinica, Ser. B, vol. 8, fasc. 2*, Pl. I-XVI.

HUZIMOTO, H. (1944): Palaeontological study on Titibu-System of the Taisyaku-kyo Region, Hiroshima Prefecture. *Studies from Geol. and Min. Inst. Tokyo Bunrika Daigaku, No. 1.*

JEFFORDS, R. M. (1947): Pennsylvanian Lophophyllidid Corals. *Univ. Kansas Paleontol. Contrib., Coelenterata, Art. 1*, pp. 1-84, Pls. 1-28, figs. 1-9.

MERRIAM, C. W. (1942): Carboniferous and Permian corals from Central Oregon. *Jour. Paleontol., vol. 16, no. 3*, pp. 372-381, Pls. 54 57.

MINATO, M. (1955): Japanese Carboniferous and Permian Corals. *Jour. Fac. Sci. Hokkaido Univ., Ser. IV, vol. IX, no. 2.*

—— and others (1954): Zur Biostratigraphie der permischen Formation des Setamai-Geländes im Süd-Kitakami Gebirge (Stratigraphische und tektonische Untersuchungen des japanischen Paläozoikums, Teil 9). *Jour. Geol. Soc. Japan, vol. LX. no. 708*, p. 378.

MOORE, R. C. (1956, *edit.*): Treatise on Invertebrate Paleontology, Part F, Coelenterata. *Geol. Soc. Amer. and Univ. Kansas Press.*

—— and R. M. JEFFORDS (1945): Description of Lower Pennsylvanian corals from Texas and adjacent States. *Univ. Texas Publ., no. 3301.*

SCHOUPPE, A. v. and P. STACUL (1955): Die Genera *Verbeekiella* PENECKE, *Timorphyllum* GERTH, *Lophophyllidium* GRABAU aus dem Perm von Timor. *Palaeontographica Suppl. Iv, V Art., Liefg. 3*, pp. 95-196.

SMITH, S. and T. A. RYDER (1926): The

genus *Corwenia*, gen. nov. *Ann. and Mag., Nat. Hist., 9th ser., vol. 18*, p. 140.

TSENG, T. C. (1950): On the genera *Stylidophyllum* and *Polythecalis*. *Bull. Geol. Soc. China, vol. 30, nos. 1-4.*

WAAGEN, W. and J. WENTZEL (1886): Salt Range Fossils, Teil 6, Coelenterata, *Palaeontol. Indica, (13) vol. 1.*

YABE, H. (1909): Materials for a knowledge of the Anthracolithic fauna of Japan. *Jour. Geol. Soc. Tokyo, vol. 9*, p. 4.

—— (1950): Permian Corals resembling *Waagenophyllum* and *Corwenia*. *Proc. Japan Acad., vol. 26*, p. 76.

—— and I. HAYASAKA (1916-17): Paleozoic corals from Japan, Korea and China. *Jour. Geol. Soc. Tokyo, vols. 22-23.*

YOH, S. S. (1932): The coral fauna of the Chisia limestone of the Lower Yangtze Valley. *Palaeontol. Sinica, Ser. B, vol. VIII, fasc. 1*, Pls. I-X.

YOSHINO, M. (1937): Palaeozoic fossils found in the limestone of Taishakudai, Bingo Province (I-II). *Jour. Geogr., vol. XLIX, no. 580*, p. 269; *no. 581*, p. 307.

## Explanation of Plate 28

Figures 1a~d and 2a~d, *Waagenophyllum* cfr. ***akasakensis*** (YABE).

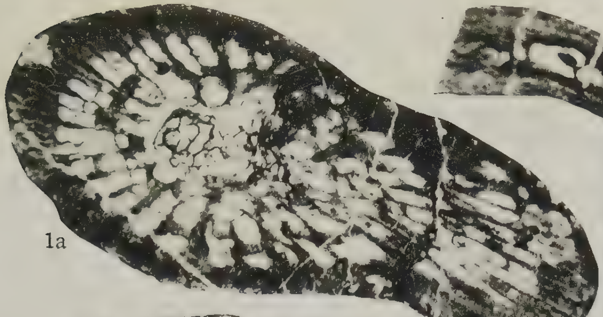
Serial sections of accompanying corallites (×10).

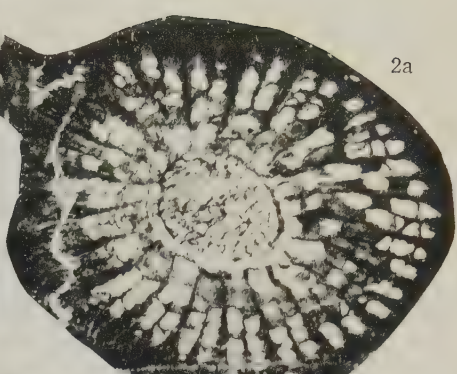
Figures 3a~e, *Waagenophyllum longiseptatum*, sp. nov.

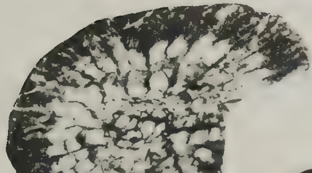
3a~d, serial transverse sections of ephebic stages of a corallite (×5); 3e, longitudinal section (×5), drawing through Camera lucida apparatus.

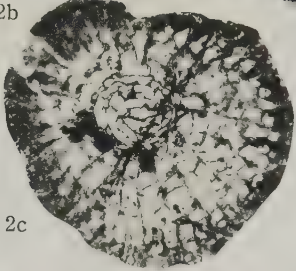
Figures 4a~d, *Waagenophyllum* sp.

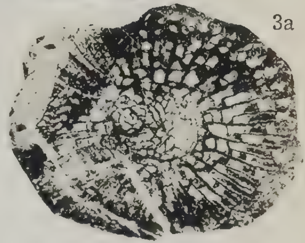
4a~d, transverse sections, in which 4d is an ephebic part accompanying with another corallite of 'mature' stage.

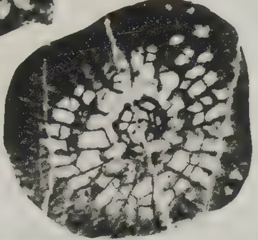

1a

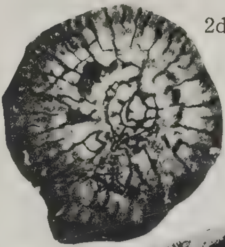

2a

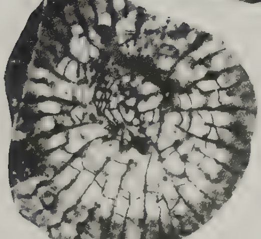

1b

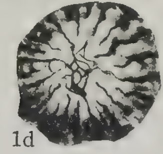

2b

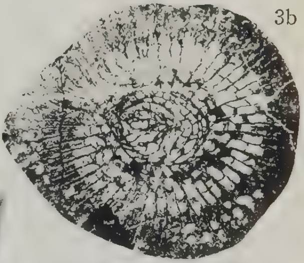

3a

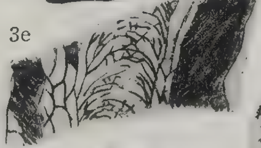

2c

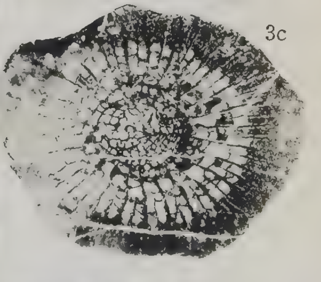

2d

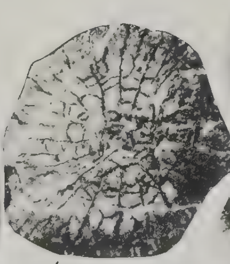

1c

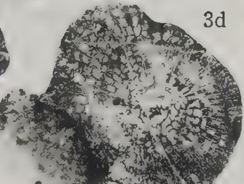

1d

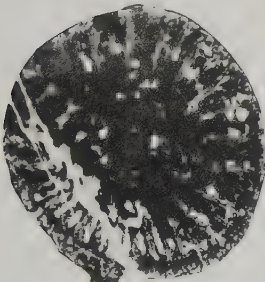

3b

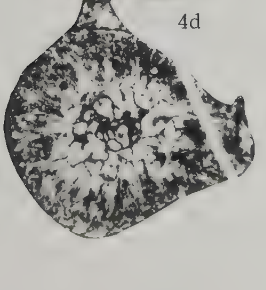

3e

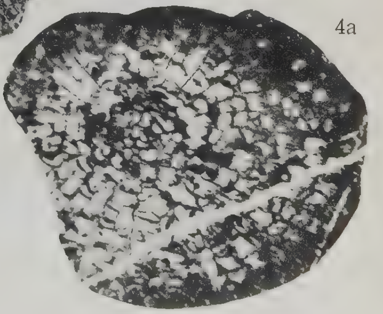

3c

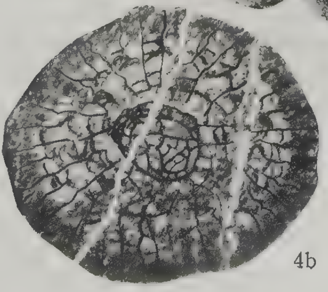

4c


3d


4d




4a


4b

Trans. Proc. Palaeont. Soc. Japan, N. S., No. 38, pp. 249-262, pls. 29-30, June 1, 1960

# 381. ON THE MIOCENE PECTINIDAE FROM THE ENVIRONS OF SENDAI; PART 16, *PECTEN KIMURAI* YOKOYAMA AND *PALLIOLUM* CF. *PECKHAMI* (GABB)*

KÔICHIRÔ MASUDA

Department of Geology, Faculty of Education, Tohoku University

仙台附近中新統産 Pectinidae；その 16, *Pecten kimurai* Yokoyama 及び *Palliolum* cf. *peckhami* (Gabb)：*Pecten kimurai* は，日本各地の中新統から多数産出するために非常に重要な種である。併し *kimurai* の模式標本が不完全なものであったためと，これに極めて類似した多数の種又は亜種が記載されたために，研究者の意見がまちまちで多くの混乱が生じていた。筆者はこれらの混乱を解決するため，模式地を含む多くの産地からの標本を再検討し，*kimurai* のグループを，産出が中新世初期に限られる *kimurai murayamai, kimurai ugoensis, kimurai tiganouraensis, kimurai yudaensis* と，中新世中乃至後期に限られる *kimurai kimurai, kimurai nakosoensis* の 6 亜種に分けた。

更に *Palliolum* cf. *peckhami* (Gabb) を報告した。　　　　増田孝一郎

## Introduction and Acknowledgements

*Pecten kimurai*, first described by Yokoyama (1925) from the Miocene of the Jôban Coal Field, was subsequently reported from numerous Neogene localities of Japan, and therefore it has been considered to be important stratigraphically and chronologically. However, because its true characters are not well known this species is confusing, that is to say, the type consisted of rather imperfect specimens without designation of type locality or holotype. His subsequently described *Pecten murayamai* closely resembles *kimurai*, but unfortunately it was not discriminated it from *kimurai* at that time. Hatai and Nisiyama (1939) designated the type of *kimurai* to be Yokoyama's Pl. 4, figs. 1, 2, 5, and identified Pl. 4, fig. 4 with *murayamai*, but later they (1952) selected the lectotype as Pl. 4, fig. 4 which was previously identified with *murayamai* and designated the type locality as Tamaye, Kobisa, Obisa-mura, Futaba-gun, Fukushima Prefecture and the formation to be the Kamenoo. However, this locality is considered as belonging to the Oligocene Shirasaka formation, and since that species does not seem to occur in that horizon, there may have been a mistake in the labels. Consequently the type locality of *kimurai* is considered to be the Miocene Kokozura formation at Izura, Ôtsu-machi, Kita-Ibaraki City, Ibaraki Prefecture.

Numerous specimens of *kimurai* and its related species were studied and the results lead to that the *kimurai* group may be classified into six subspecies, namely, *kimurai kimurai, kimurai murayamai, kimurai ugoensis, kimurai tiganouraensis, kimurai yudaensis*, n. subsp. and *kimurai nakosoensis*, n. subsp. respectively.

---

* Read at the Annual Meeting of the Society at Tokyo, Dec. 7, 1958; received April 3, 1959.

Acknowledgements are due to Dr. Kotora HATAI of the Department of Geology, Faculty of Education, Tohoku University, for his supervision. Thanks are due to Dr. Jyûzô ARAI of the Chichibu Museum Natural History, Saitama Prefecture and Mr. Yasuhiko KAMADA of the Department of Geology, Faculty of Arts and Sciences, Nagasaki University, for their kind information of the stratigraphy, to Dr. Saburô KANNO of the Institute of Geology and Mineralogy, Faculty of Science, Tokyo University of Education, for his kind offer of some plaster-casts of *Patinopecten,* and to Messrs Shin-ichi HONMA of the Kanazawa High School in Kanai-mura, Sado-gun, Niigata Prefecture and Isamu ÔTSUKI of the Shiogama Dai-ichi Middle School, Shiogama City, Miyagi Prefecture and Dr. Tamio KOTAKA of the Institute of Geology and Paleontology, Faculty of Science, Tohoku University, for their kind offer of specimens.

## Description

### Family Pectinidae

### Subfamily Pectininae

### Genus *Patinopecten* DALL, 1898

### *Patinopecten kimurai kimurai* (YOKOYAMA), 1925

Plate 29, Figure 1; Plate 30, Figure 6

1925. *Pecten kimurai* YOKOYAMA, *Jour. Coll. Sci., Imp. Univ. Tokyo, Vol. 45, Art. 5,* p. 27, pl. 2, fig. 4; pl. 4, figs. 1-6.

1957. *Patinopecten kimurai,* FUJIE and UOZUMI, *Cenozoic Research, No. 23,* p. 34, pl. 24, fig. 10.

*Description:*—Shell moderate, rather thin, suborbicular, compressed, equilateral except for auricles; right valve more convex than left; radiately ribbed and forming an angle of about 100° at apex. Right valve gently inflated, with about 9, elevated, round-topped radial ribs, fine concentric growth lines and obtuse network; radial ribs a little broader than their interspaces or sometimes nearly equal, divided into two or three, very fine radial threads by shallow longitudinal furrows near beak but usually tend to become obsolete downwards, rarely dichotomous, and usually provided with a few or several, faint, fine longitudinal striae or sometimes rather distinct longitudinal riblets on their backs and flanks; radial ribs near submargins very low and slender, much narrower than their interspaces, sometimes dichotomous; longitudinal striae on backs and flanks of radial ribs usually appear at about half of disc and rather more distinct near submargins than those of central part of disc, but inaccessible in young shell; interspaces between radial ribs gently rounded and smooth-bottomed, show no sharp demarcation against radial ribs, and rarely provided with a few, faint, fine longitudinal striae near submargins; anterior auricle furnished with wide and shallow byssal notch, rather wide byssal area, sculptured with several, faint, fine radial threads and concentric lines; posterior one nearly equal to anterior and similar to anterior in sculpture; hinge with rather distinct cardinal crura, wide and shallow resilial pit provided with rather distinct, short lateral ridges, and ill-developed ctenolium in young shell. Left valve nearly flat or a little inflated, with distinctly elevated, sharp radial ribs, fine concentric growth lines and rather distinct, fine network; radial ribs sharp, roof shaped but tend to become more or less rounded towards ventral margin in adult specimen; radial

Table I. Measurements of the selected specimens of the *kimurai* group (in mm.)

| Subspecies | Locality | Height | Length | Hinge-length | Depth | Apical angle | Valve |
|---|---|---|---|---|---|---|---|
| *kimurai* | A | 63 | — | 28 | 10 | 100° | R+ |
| | | 63 | — | 28 | 6 | 100° | L+ |
| | | 60 | 59.5 | 26 | 9 | 100° | R+ |
| | | 60 | 59.5 | 26 | 4.5 | 100° | L+ |
| | | 36.5 | 35 | — | 4.5 | 100° | R+ |
| | | 36.5 | 35 | — | 4 | 100° | L+ |
| | | 65 | 63 | 28.5 | 10 | 100° | R |
| | | 80 | 78 | — | 6 | 100° | L |
| | | 72 | 70 | — | 6 | 100° | L |
| | B | — | 77 | 38 | 13 | 100° | R |
| | | — | 63 | 30 | 7.3 | 100° | L |
| | | 62 | 59 | — | 7 | 100° | L |
| | | 31 | 28 | 15 | 3.2 | 95° | L |
| *nakosoensis* | C | 72 | 70 | — | 9 | 100° | R |
| | | 71 | 67 | — | 11.5 | 100° | R |
| | | 69 | 65 | 35 | 11 | 100° | R |
| | | 66 | 68 | — | 8.8 | 100° | R |
| | | 62 | 61 | 31 | 9 | 95° | R |
| | | 36.5 | 35 | 19.5 | 5.2 | 100° | R |
| | | 85 | 82 | 42 | 12.2 | 100° | L |
| | | 73 | 68 | 35 | 8.5 | 100° | L |
| | | 66 | 64 | 32 | 10.2 | 100° | L |
| | | 37 | 33 | 20.5 | 4 | 100° | L |
| | D | 74 | 73 | 37 | 11 | 100° | R |
| | | 71 | — | 32 | 12.5 | 95° | R |
| | | 47.5 | 44.5 | 22.5 | — | 100° | L |
| | | 22 | 20 | 11 | 3 | 100° | L |
| *yudaensis* | E | — | 105 | 55 | 16 | 100° | R |
| | | — | 80 | 44 | 11 | 100° | R |
| | | — | 105 | 55 | 10 | 100° | L |
| | | 75 | 75 | 38 | 8 | 100° | L |
| | F | 106 | 104 | 47 | 15.3 | 100° | R |
| *murayamai* | F | 97 | 94 | 44 | 12.4 | 100° | R |
| | | 95 | 93.5 | 44 | 13 | 100° | L |
| | | 65.5 | 64 | 35 | 8.4 | 100° | L |
| | | 37.4 | 37.2 | — | 4.6 | 100° | L |
| | G | 123 | 123 | 55 | 15.5 | 100° | R |
| | | 109 | 105 | — | 13.3 | 100° | R |
| | | — | 100 | 50 | 15.4 | 100° | R |
| | | 38 | 37.5 | 20 | 6 | 100° | R |
| | | 11 | 10.8 | 7.3 | 1.5 | 100° | R |
| | | 106 | 106 | 47 | 17 | 105° | L |
| | | 27.5 | 25.5 | 15 | 4 | 100° | L |
| | | 24.5 | 24 | 14 | 4 | 100° | L |
| | | 16 | 15 | 10 | 2.2 | 100° | L |
| *ugoensis* | H | 92 | 92.5 | 47 | 11 | 105° | R |
| | | 86 | 84 | 38 | 10 | 105° | R |
| | | 79 | 77 | 35 | 10.3 | 100° | R |
| | | 79 | 77 | 35 | 8.4 | 100° | L |
| | | 70 | 69.5 | 35 | 9 | 105° | R |
| | | 32 | 31 | 16.5 | 3 | 105° | R |
| | | 100 | 100 | 40 | 16.8 | 105° | L |
| | | 82 | 79 | 37 | 11.5 | 105° | L |
| | | 76.5 | 72 | 30 | 10 | 105° | L |
| | | 75 | 73.5 | 30 | 9 | 105° | L |
| | | 57 | 55.5 | 26 | 7.6 | 100° | L |
| | | 34 | 33 | 15 | 3.2 | 105° | L |
| *tiganouraensis* | I | — | 80 | 45 | 11 | 100° | R |
| | | 40 | 39 | 19 | 6 | 100° | R |
| | | 27.5 | 27 | 13 | — | 100° | R |
| | | 22.5 | 22 | 12 | 3.5 | 100° | R |
| | | 86.5 | 84 | 42 | 7 | 100° | L |
| | | 47 | 43 | 25 | 5 | 100° | L |
| | | 28 | 28 | 15 | — | 100° | L |

+—Intact valves.

A—Izura, Ôtsu-machi, Kita-Ibaraki City, Ibaraki Prefecture (Kokozura formation). B—Kokozura, Nakoso City, Fukushima Prefecture (Kokozura formation). C—Kagitori, Fukuoka-machi, Ninohe-gun, Iwate Prefecture (Kadonosawa formation). D—Anaushi, Fukuoka-machi, Ninohe-gun, Iwate Prefecture (Suenomatsuyama formation). E—Yuda, Kintaichi-mura, Ninohe-gun, Iwate Prefecture (Shiratori formation). F—Totsugawa, Kanai-mura, Sado-gun, Niigata Prefecture (Orito formation). G—Kitano, Yasawagi, Ômori-machi, Hiraga-gun, Akita Prefecture (Sugota formation). H—Ukibuta, Higashi-Yuri-mura, Yuri-gun, Akita Prefecture (Sugota formation). I—Higashi-Shiogama, Shiogama City, Miyagi Prefecture (Ajiri formation).

ribs near submargins low and slender, their interspaces sometimes provided with a few, very faint, fine longitudinal striae; interspaces between radial ribs usually smooth, rarely with rather fine intercalary threads which usually appear near beak; anterior auricle somewhat larger than posterior one, sculptured with fine concentric lines and a few, faint, fine radial threads, though sometimes inaccessible, posterior one similar to anterior in sculpture. Interior surface of valves gently folded corresponding to external sculpture.

*Dimensions*:—Table I.

*Comparison and Affinity*:—*Patinopecten tokyoensis* (TOKUNAGA) (1906) originally from the Pleistocene Tokyo formation at Oji, Kita-ku, Tokyo-to, resembles *kimurai*, but can be distinguished by its less elevated and prominent radial ribs, rather more distinct division of the radial ribs, its larger HL/H, shape of auricles, rather distinct cardinal crura of the right valve, small denticle at extremities of resilial pit and its obscure demarcation against the internal surface in the left valve. OTUKA (1934, 1936) considered *kimurai* to be a subspecies of *tokyoensis*, but here from a comparative study it is thought to be of specific ranking. *Patinopecten kagamianus moniwaensis* MASUDA (1958) from the Moniwa formation at Moniwa, Sendai City, can be distinguished from *kimurai* by having rather thick shell, less elevated radial ribs, more distinct and numerous longitudinal striae on the backs and flanks of the radial ribs in the right valve, by the somewhat more inflated left valve and by the shape of radial ribs. At times it is difficult to distinguish between them in the case of young shells. *Kimurai* resembles *Patinopecten kobiyamai* KAMADA (1954) from the Miocene Kabeya formation at Nakayama, Ôno-mura, Iwaki-gun, Fukushima Prefecture, but can be distinguished therefrom by the more elevated and fewer radial ribs of the right valve and by the left valve having more numerous, more or less imbricated, fine radial threads on the backs of radial ribs and in their interspaces. *Patinopecten chichibuensis* KANNO (1957) from the Iwadonosawa formation at Nenokami, Yoshida-machi, Chichibu-gun, Saitama Prefecture, also resembles the present one, but it has a less number of radial ribs.

*Remarks*:—Among the described features, the observable characters of the radial ribs depend upon the degree of preservation. Their number varies from 8 to 13, but in general the most frequent number is 9. In specimens with a large number of radial ribs, they are somewhat lower and a little more rounded than in examples with fewer radial ribs, though otherwise they are similar. In some specimens the longitudinal striae or riblets on the backs and flanks of the radial ribs are rather distinct but in others they are faint.

*Type locality, Geological formation and Age*:—Sea cliff at Izura, Ôtsu-machi, Kita-Ibaraki City, Ibaraki Prefecture (Lat. 36°40′ 06″ N., long. 140°48′ 02″ E.). Kokozura formation. Middle Miocene.

*Depository*:—Topotype, DGS, Reg. Nos. 3701, 3702.

*Distribution*:—Kokozura formation in Fukushima and Ibaraki Prefectures and Kadonosawa formation in Iwate Prefecture: both Middle Miocene in age.

### *Patinopecten kimurai murayamai* (YOKOYAMA), 1926

Plate 29, Figures 6, 7; Plate 30, Figures 3, 4

1926. *Pecten murayamai* YOKOYAMA, *Jour. Fac. Sci., Imp. Univ. Tokyo, Sec. 2, Vol.*

*1, Pt. 9*, p. 387, pl. 44, figs. 18–20.

1934. *Patinopecten kimurai*, OTUKA, *Jour. Geol. Soc. Japan, Vol. 50, No. 592*, p. 223, pl. 2, fig. 10.

1955. *Patinopecten kimuroi*, KANNO, *Trans. Proc. Palaeont. Soc. Japan, N. S., No. 18*, p. 33, pl. 6, figs. 4–8.

*Description:*—Shell large, thick, suborbicular, compressed, equilateral except for auricles, nearly equivalve, though right valve somewhat more or very rarely less convex than left valve; radiately ribbed and forming an angle of about 100° at apex. Right valve gently inflated, with about 9, rather distinctly elevated, stout, round-topped radial ribs and fine concentric growth lines; radial ribs broader than their interspaces, usually divided into two or three, faint, fine radial threads by shallow longitudinal furrows near beak but tend to become obsolete downwards, rarely dichotomous, and usually provided with several, faint, fine longitudinal striae on their backs and flanks near dorso-ventral margins; radial ribs near submargins low and slender, narrower than their interspaces; longitudinal striae on backs and flanks of radial ribs usually appear at about half of disc in full adult, but not in young shell; interspaces between radial ribs smooth-bottomed, usually show rather sharp demarcation against radial ribs; anterior auricle with wide and shallow byssal notch, rather wide byssal area, with several, fine radial threads and concentric lines; posterior one nearly equal to anterior, similar in sculpture; hinge with rather distinct cardinal crura, wide and shallow resilial pit with rather distinct lateral ridges, and ill-developed ctenolium in young shell. Left valve gently inflated, with distinct radial ribs, fine concentric growth lines, and rather distinct, fine network; radial ribs rather sharp near beak but usually tend to become rounded towards ventral margin, and sometimes with a few, very faint, fine longitudinal striae on backs and flanks near ventral margin in full adult; interspaces between radial ribs usually smooth, sometimes with one or rarely two, very faint, fine radial threads near beak but tend to become obsolete downwards, and rarely with rather fine intercalary threads which usually appear near beak; auricles nearly equal to each other, with several, rather faint, fine threads and fine concentric lines. Interior surface of valves gently folded corresponding to external sculpture.

*Dimensions:*—Table I.

*Comparison and Affinity:*—The present subspecies is distinguished from *kimurai* by its large, subequivalved, rather thick shell, rather distinctly elevated radial ribs which show rather sharp demarcation aginst their interspaces, ill-developed longitudinal striae and by the left valve having rather rounded and somewhat less elevated radial ribs than that of *kimurai*.

*Remarks:*—The number of radial ribs varies from 8 to 12, but the most frequent numer is 9. The radial ribs of most specimens of the right valve are usually rather distinctly elevated and show rather sharp demarcation against their interspaces, but in some specimens they are somewhat low and do not show sharp demarcation against their interspaces.

*Type locality, Geological formation and Age:*—Kinonezaka, Yasawagi, Ômori-machi, Hiraga-gun, Akita Prefecture. Sugota formation. Early Miocence.

*Described specimens:*—Kitano, Yasawagi, Ômori-machi, Hiraga-gun, Akita Prefecture (Lat. 39°27′47″ N., long. 140° 31′39″ E.). Conglomeratic coarse-grained sandstone of the Sugota formation. DGS, Reg. Nos. 1904, 1905.

*Depository*:—Holotype, Reg. No. ?, Institute of Geology, Faculty of Science, Tokyo University.

*Distribution*:—Sugota formation in Akita Prefecture. Orito formation in Niigata Prefecture, Tanosawa formation in Aomori Prefecture, Nagura formation in Saitama Prefecture, Ôisawa and Shunezaka formations in Yamagata Prefecture, Futatsugoya formation in Fukushima Prefecture, Ajiri formation in Miyagi Prefecture, Higashi-Innai formation in Ishikawa Prefecture, Taishu formation in Nagasaki Prefecture and Heiroku formation in Korea:—all Early Miocene in age.

### *Patinopecten kimurai ugoensis* (HATAI and NISIYAMA), 1939

Plate 29, Figure 4; Plate 30, Figure 5

1939. *Pecten kimurai ugoensis* HATAI and NISIYAMA, *Jour. Geol. Soc. Japan, Vol. 46, No. 544*, p. 39, 2 text-figs.

*Description*:—Shell moderate in size and thickness, compressed, equilateral except for auricles, subequivalve, although left valve usually a little less convex than right; radiately ribbed and forming an angle of about 105° at apex. Right valve gently inflated, with about 9, low, smooth, flatly rounded radial ribs, rather distinct, fine concentric growth lines and obtuse network; radial ribs much broader than their interspaces, usually divided into two or three, very faint, fine radial threads by shallow longitudinal furrows near beak but tend to become obsolete downwards, rarely dichotomous, and provided with numerous, very faint, fine longitudinal striae on their backs and flanks near ventral margin; radial ribs near submargins very low, tend to become obsolete towards dorsal margin; longitudinal striae very faint and only recognizable by reflected light, but a little more distinct near submargins; interspaces between radial ribs gently rounded and smooth, but rarely with a few, faint, fine longitudinal striae near submargins; anterior auricle subequal to posterior, furnished with shallow and wide byssal notch, rather wide byssal area, with several, faint, fine radial threads and rather distinct concentric lines, and posterior auricle with concentric lines and with or without faint, fine radial threads; hinge with distinct cardinal crura, wide and shallow resilial pit with distinct lateral ridges and ctenolium in young shell. Left valve gently inflated, with distinct but low radial ribs, concentric growth lines and rather distinct, fine network; radial ribs rather low, much narrower than their interspaces, rather sharp near beak but tend to become rounded towards ventral margin; interspaces between radial ribs smooth-bottomed, rarely with an intercalary thread which appears near beak; anterior auricle subequal to posterior one, with rather distinct, fine concentric lines and a few, faint, fine radial threads which tend to become obsolete towards margins, and posterior auricle nearly similar to anterior in sculpture, though radial threads a little less distinct than those of anterior. Interior surface of valves gently folded corresponding to external sculpture.

*Dimensions*:—Table I.

*Comparison and Affinity*:—The present subspecies is distinguished from the other subspecies by the low, flatly rounded radial ribs which are much broader than their interspaces in the right valve, and by the nearly equivalved shell. However, in the case of the young *ugoensis* it is difficult to distinguish it from the others.

*Type locality, Geological formation and Age*:—About 100 m. west of the tunnel at Ukibuta, Higashi-Yuri-mura, Yuri-gun, Akita Prefecture (Lat. 39°18′45″ N., long. 140°20′25″ E.). Sugota formation. Early Miocene.

*Depository*:—Holotype, SM, Reg. No. 7166.

*Described specimens*:—Topotype, DGS, Reg. Nos. 1921 and 3672. Conglomeratic coarse-grained sandstone of the Sugota formation.

*Distribution*:—Sugota formation in Akita Prefecture and Tanosawa formation in Aomori Prefecture: both Early Miocene in age.

### *Patinopecten kimurai tiganouraensis* (NAKAMURA), 1940

Plate 29, Figure 5

1940. *Pecten* (*Patinopecten*) *kimurai tiganouraensis* NAKAMURA, *Japan. Jour. Geol. Geogr.*, *Vol. 17*, *Nos. 1-2*, pl. 13, fig. 5

*Description*:—Shell rather large, suborbicular, compressed, equilateral except for auricles; right valve more convex than left; radiately ribbed and forming an angle of about 100° at apex. Right valve gently inflated, with 6 to 7, elevated, round-topped radial ribs, fine concentric growth lines and obtuse network; radial ribs broader or nearly equal to their interspaces, sometimes with several, faint, fine longitudinal striae on their backs and flanks; radial ribs near submargins low and slender, much narrower than their interspaces, and sometimes dichotomous near beak by shallow interspaces; interspaces between radial ribs gently rounded and smooth-bottomed; anterior auricle with wide and shallow byssal notch and rather narrow byssal area, with several, faint, fine radial threads and concentric lines; posterior one nearly equal to anterior in sculpture, though less distinct in posterior. Left valve nearly flat or a little inflated, with about 6, elevated, sharp radial ribs, concentric growth lines and rather distinct, fine network; radial ribs usually sharp but gradually tend to become more or less rounded towards ventral margin, and rarely with very faint longitudinal striae on their flanks near ventral margin; interspaces between radial ribs rounded and smooth-bottomed; anterior auricle a little larger than posterior one, sculptured with fine concentric lines; posterior auricle similar to anterior in sculpture.

*Dimensions*:—Table I.

*Comparison and Affinity*:—This subspecies is distinguishable from *kimurai* by the less number of radial ribs and ill-developed longitudinal striae on the backs and flanks of radial ribs. It differs from the other subspecies by the fewer radial ribs and the nearly flat or little inflated left valve. *Patinopecten chichibuensis* is distinguishable from the present one by the higher shell and the well developed longitudinal striae on the backs of radial ribs and in their interspaces.

*Type locality, Geological formation and Age*:—Cliff of the hill immediately northeast of the Shiogama Fisheries Market, Shiogama City, Miyagi Prefecture (Lat. 38°18′ N., long. 140°04′ E.). Ajiri formation. Early Miocene.

*Depository*:—SM, Reg. No. 2555.

*Described specimens*:—Plaster casts from the sea cliff about 500 m. east of the Tohoku Regional Fisheries Research Laboratory, Higashi-Shiogama, Shiogama City, Miyagi Prefecture (Lat. 38°19′27″ N., long. 141°02′52″E.). Massive tuffaceous very fine-grained sandstone to tuffaceous sandy siltstone of the Ajiri formation. DGS, Reg. No. 3703.

*Distribution:*—Ajiri formation in Miyagi Prefecture and Higashi-Innai formation in Ishikawa Prefecture: both Early Miocene in age.

### *Patinopecten kimurai yudaensis* MASUDA, n. subsp.

Plate 30, Figures 1, 2

*Description:*—Shell rather large, moderately thick, suborbicular, compressed, equilateral except for auricles; right valve a little more convex than left; radiately ribbed and forming an angle of about 100° at apex. Right valve gently inflated, with about 9, rather elevated, smooth, round-topped radial ribs, fine concentric growth lines and obtuse network; radial ribs narrower than their interspaces, divided into two or three, faint, fine radial threads by shallow longitudinal furrows near beak but usually tend to become obsolete downwards, and sometimes divided into rather distinct, two or three or rarely a little more riblets with shallow interspaces, one being usually larger than others; radial ribs near submargins low and slender, much narrower than their interspaces, sometimes dichotomous; interspaces between radial ribs gently rounded and smooth-bottomed, but rarely with a few, faint, fine longitudinal striae near submargins; anterior auricle subequal to posterior, with wide and shallow byssal notch, rather wide byssal area, with fine concentric lines and a few, faint, fine radial threads, and posterior one similar to anterior in sculpture; hinge with rather distinct cardinal crura, wide and shallow resillial pit provided with rather distinct, wide-opening, short lateral ridges. Left valve gently inflated, with rather sharp, moderately elevated radial ribs, fine concentric growth lines and distinct, fine network; radial ribs narrower than their interspaces, usually sharp near beak but tend to become somewhat rounded towards ventral margin, rarely with a few, faint, fine longitudinal threads on their backs and flanks, and rarely dichotomous; interspaces between radial ribs gently rounded and smooth-bottomed, rarely with a fine intercalary thread which usually appears near beak; auricles nearly equal, with fine concentric lines and a few, faint, fine radial threads. Interior surface of valves gently folded corresponding to external sculpture.

*Dimensions:*—Table I.

*Comparison and Affinity:*—This subspecies differs from the other subspecies of the *kimurai* group by the radial ribs being narrower than their interspaces and sometimes divided into two or three or rarely a little more, rather distinct riblets in the right valve.

*Type locality, Geological formation and Age:*—Right river side of Mabechi-gawa at Yuda, Kintaichi-mura, Ninohe-gun, Iwate Prefecture (Lat. 40°19′ N., long. 141°19′10″ E.). Shiratori formation. Early Miocene.

*Depository:*—Holotype, DGS, Reg, No. 1936. Paratype, DGS, Reg. Nos. 1935, 2439 and IGPS, coll. cat. no. 17621.

*Occurrence:*—Shiratori formation at the type locality and at Nisatai, Fukuoka-machi, Ninohe-gun, Iwate Prefecture.

### *Patinopecten kimurai nakosoensis* MASUDA, n. subsp.

Plate 29, Figures 2, 3

*Description:*—Shell moderate, rather thin, suborbicular, compressed, equilateral except for auricles; right valve somewhat more convex than left; radiately ribbed and forming an angle of about 100° at apex. Right valve gently inflated, with about 9, elevated, round-topped radial ribs, fine concentric growth lines and obtuse network; radial ribs broader than their interspaces, divided into two or three, faint, fine radial threads by shallow longitudinal furrows near beak but tend to become obsolete downwards, and usually provided with several, faint, fine longitudinal striae or riblets on their backs and flanks; radial ribs near submargins low and slender, much narrower than their interspaces and sometime dichotomous; longitudinal striae usually appear at lower half of disc, and rather more distinct near submargins than on central part of disc, but not seen in young shell: interspaces between radial ribs gently rounded and smooth-bottomed, but sometimes provided with a few, very faint, fine longitudinal striae near submargins; anterior auricle furnished with wide and shallow byssal notch, rather wide byssal area, with several, faint, fine radial threads, concentric lines, and posterior one similar to anterior in sculpture; hinge with distinct cardinal crura, wide and shallow resilial pit with wide-opening, rather low lateral ridges, and ill-developed ctenolium in young shell. Left valve gently inflated, with distinct, rather elevated radial ribs, fine concentric growth lines and rather distinct, fine network; radial ribs rather sharp near beak, usually tend to become rather rounded, and with a few, fine longitudinal riblets, or rarely they divided into two or three, rather distinct, fine radial threads by shallow longitudinal furrows on upper half of disc; radial ribs near submargins low and slender, and sometimes their interspaces with a few, faint, fine longitudinal striae; interspaces between radial ribs gently rounded and smooth-bottomed, rarely with intercalary threads which usually appear near beak; anterior auricle somewhat larger than posterior, with several, fine radial threads and concentric lines, and posterior one similar to anterior in sculpture. Interior surface of valves gently folded corresponding to external sculpture.

*Dimensions:*—Table I.

*Comparison and Affinity:*—This new subspecies differs from *kimurai* by the right valve having rather more elevated radial ribs and by the left valve with radial ribs which are less elevated and sharp, and usually with a few, fine longitudinal riblets on their backs and by the subequivalved shell. Also it is distinguishable from *murayamai* by its rather thin shell, rather less elevated radial ribs of the right valve and by the left valve having rather well developed longitudinal striae or riblets.

*Type locality, Geological formation and Age:*—Road-side cliff at Kokozura, Nakoso City, Fukushima Prefecture (Lat. 36°51′18″ N., long. 140°47′39″ E.). Kokozura formation. Middle Miocene.

*Depository:*—Holotype, DGS, Reg. No. 1930, Paratype, DGS, Reg. No. 3713.

*Occurrence:*—Kokozura formation at the type locality, upper part of Kadonosawa formation and Suenomatsuyama formation in Iwate Prefecture and Takahoko formation in Aomori Prefecture:—all Middle to Late Miocene in age.

## Subfamily Amusiinae

### Genus *Palliolum* Monterosato, 1884

### *Palliolum* cf. *peckhami* (Gabb), 1869

Plate 31, Figures 7-10

Compare with:

1906. *Pecten* (*Pseudamusium*) *peckhami*, ARNOLD, *U. S. Geol. Surv., Prof. Paper, No. 47*, p. 56, pl. 3, figs. 6–8.

1934. *Pecten* (*Pseudamussium*) *peckhami*, OHSE, *Jour. Geol. Soc. Japan, Vol. 41, No. 486*, p. 126, pl. 4, figs. 1–4.

*Descriptions*:—Several cast or mould specimens from the Aoso formation; their detail characters can not be observed. However, these specimens are characterized by the small, suborbicular shell, a few, rather coarse concentric growth lines, faint, fine crosshatches which are produced by faint, fine radial threads and faint, fine concentric lines between the coarse concentric lines, small but distinct anterior auricle with narrow and deep byssal notch and rather wide byssal area, sculptured with rather distinct, several, fine radial threads and concentric lines, and the not defined posterior auricle.

This may be the first record of this genus from the environs of Sendai.

*Described specimens*:—About 1.5 km. west of Ishikura, Taiwa-machi, Kurokawa-gun, Miyagi Prefecture (Lat. 38° 21′36″N., long. 140°50′12″E.). Tuffaceous sandy siltstone of the Aoso formation (late Early Miocene). DGS, Reg. No. 3704.

*Associated fauna*:—*Lima* cf. *goliath* SMITH, *Gloripallium crassivenium* (YOKOYAMA), *Lucinoma actilineatum* (CONRAD), *Dentalium* sp., *Terebratulina heleuae* HATAI, *Dallina* cf. *raphaelis* (DALL), *Laqueus* sp., etc.

### Remarks on the *kimurai* group

As already pointed out, *Patinopecten tokyoensis* is closely related to the *kimurai* group. HATAI (1936) concluded that *kimurai* is related to *tokyoensis* in the sense of mutation and not variation, and that *kimurai* is ancestral to *tokyoensis*. The geological range of the members of the *kimurai* group is restricted to the Miocene and while that of *tokyoensis* is from Early Pliocene to Late Pleistocene, thus, the writer also considers that the *kimurai* group may be ancestral to *tokyoensis*.

*Patinopecten kimurai kimurai* is rather abundant in the Kokozura formation at the sea cliff of Izura, Kita-Ibaraki City, associated with such as *Anadara watanabei* KANEHARA, *Gloripallium izurensis* MASUDA, *Macoma optiva* (YOKOYAMA), etc. A rather large number of them consist of rather well-preserved isolated shell, some of intact valves, and the minority of water-worn or broken shells. Almost all of them are arranged parallel with the bedding plane. In the case of intact valves, the right valve is always the lower and the left valve the upper, therefore, it is probable that they were buried *in situ*, and in the case of isolated ones, they are usually arranged with the convex side upwards. Thus, it is probable that the fauna at the locality was not transported from a remote place.

Several specimens of *nakosoensis* were collected from the Kokozura formation at the type locality, about 3 km. NNW of Izura in association with numerous molluscan shells. They occur usually with isolated valves, but sometimes as intact valves with natural orientation. They are well preserved. Since the geological horizon at Izura is approximately the same that of Kokozura, it is considered that *kimurai* and *nakosoensis* are allopatric forms.

The relationship between *murayamai* and *ugoensis* of the Sugota (MASUDA, 1955) and Tanosawa formations is considered to be the same as the above mentioned. In the case of the relationship between *tiganouraensis* and *mura-*

*yamai* from the Ajiri formation in the vicinity of Shiogama City, the same phenomenon as that of the above mentioned is observed. That is to say, though abundant specimens of *tiganouraensis* occur from the tuffaceous sandy siltstone of the Ajiri formation at the sea cliff of Higashi-Shiogama, Shiogama City in association with numerous molluscs, only a few specimens of *murayamai* occurred from the tuffaceous coarse-grained sandstone with some rounded granules at Miyato-jima, Naruse-machi, Monoo-gun, Miyagi Prefecture, about 10 km. east of the locality of Shiogama, associated with a few other molluscs. In such a case the rock facies differs at places in good accordance with the change in the faunal facies.

The same relationship as already stated for other subspecies is observed in the Higashi-Innai formation, Noto Peninsula, Ishikawa Prefecture, that is to say, *murayamai* is found in the fine- to medium-grained sandstone at Higashi-Innai, Wajima City, in association with *Operculina, Ostrea gravitesta* Yokoyama and others, while *tiganouraensis* is found from the concretions in the siltstone of the same formation at Kuninagaide, Suzu City, about 17 km, NE of Higashi-Innai, in association with some molluscs and crabs.

*Yudaensis* is common in the very fine-grained sandstone of the Shiratori formation at Yuda, Kintaichi-mura, Ninohe-gun, Iwate Prefecture and sometimes occurs from the fine-grained sandstone of that formation at Nisatai, Fukuoka-machi, Ninohe-gun, in association with numerous molluscan shells such as *Ostrea gravitesta, Siratoria siratoriensis* (Otuka), *Clementia iizukai* (Yokoyama), *Soletellina minoensis* Yokoyama, *Vicarya callosa japonica* Yabe and Hatai, etc. It occurs usually with intact valves in natural orientation. Some specimens of *kimurai* occur from the siltstone of the Kadonosawa formation at Shikonai, Kadonosawa and other places, Fukuoka-machi, in association with *Solemya tokunagai* Yokoyama, *Turritella kadonosawaensis* Otuka, etc. While *nakosoensis* is abundantly collected from the very fine-grained sandstone or siltstone of the upper part of the Kadonosawa formation at Kagitori, Kamayashiki and other places, in association with *Macoma optiva, Cultellus izumoensis* Yokoyama, *Sinum yabei* Otuka, etc, the specimens from Kagitori usually occur as isolated valves with the convex side upwards or somestimes downwards, though they are usually well preserved. They arranged parallel with the bedding plane and some of them occur with intact valves usually in natural orientation.

The specimens of *nakosoensis* from the conglomeratic tuffaceous coarse-grained sandstone intercalating granule conglomerate of the Suenomatsuyama formation at Anaushi, Fukuoka-machi and its environs, consist of isolated valves and almost all of them are more or less or severely water-worn shells. It occurs associated with rather water-worn shells of *Patinopecten yamasakii ninohensis* Masuda, *Chlamys cosibensis* (Yokoyama), *Lima goliath, Volsella dificilis* Kuroda and Habe, etc., brachiopods, balanids and echinoids. They are usually arranged nearly parallel with the bedding plane or sometimes irregularly arranged. A rather large number of them are arranged with the convex side upwards or some of them with convex side downwards. Thus, it is probable that these may have been transported from elsewhere. The occurrence of the specimens from the said formation at other localities are nearly the same as that of Anaushi, though the associated fauna somewhat differs. It is noticed that the specimens of *nakosoensis* from the Kadonosawa formation are usually rather smaller in size than those from the Suenomatsuyama formation. From the above mentioned facts it is considered that *yudaensis*, *kimurai* and *nakosoensis* are allochronic forms in this region and the above mentioned data of the *kimurai* group may be an aid in the stratigraphy of that region.

As already pointed out, *murayamai*, *ugoensis*, *tiganouraensis* and *yudaensis* are probably allopatric forms, and the relationship between *kimurai* and *nakosoensis* may be allopatric, though sometimes they may be allochronic forms. The geological range of the former group is restricted to the Early Miocene and that of the latter is probably restricted to the Middle to Late Miocene in age.

Thus, it is inferred that the different localities of them were influenced by different ecological conditions and that the variation of the external morphological features and the differences in ecological conditions may have had some relation with the birth of the subspecies. It is considered that the Early Miocene species of the *kimurai* group were originally rather warm water inhabitants.

## References

ARNOLD, R. (1906), Tertiary and Quaternary *Pectens* of California. *U.S. Geol. Surv., Prof. Paper, No. 47*, pp. 7-146, 53 pls.

FUJIE, T. and S. UOZUMI (1957), Explanation of Cenozoic Fossils from Northern Japan, 25. *Cenozoic Research, No. 23*, pp. 32-37, 1 pl.

HANZAWA, S. (1950), Tertiary Paleogeography of North Japan. *Short Papers, Inst. Geol. Paleont., Tohoku Univ., No. 2*, pp. 74-98.

HATAI, K. (1936), A Note on the Distribution of certain Species of Marine Invertebrates. *Bull. Biogeogr. Soc. Japan, Vol. 6, No. 12*, pp. 123-141.

—— and S. NISIYAMA (1939), Palaeontologi-

## Explanation of Plate 29

Fig. 1. *Patinopecten kimurai kimurai* (YOKOYAMA). Topotype, Right valve, ×1. DGS, Reg. No. 3701. Loc. Izura, Ôtsu-machi, Kita-Ibaraki City, Ibaraki Prefecture. Kokozura formation.

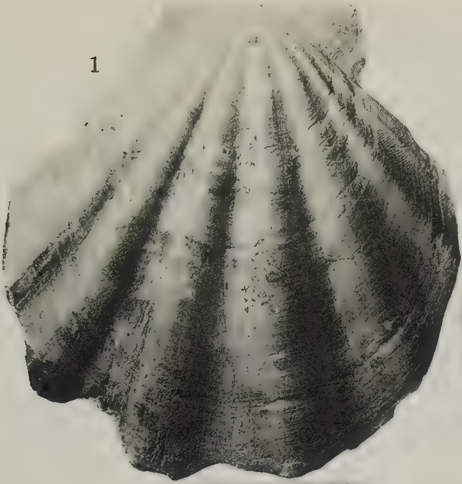
Fig. 2. *Patinopecten kimurai nakosoensis* MASUDA, n. subsp. Paratype, Right valve, ×1. DGS, Reg. No. 1940. Loc. Kokozura, Nakoso City, Fukushima Prefecture. Kokozura formation.

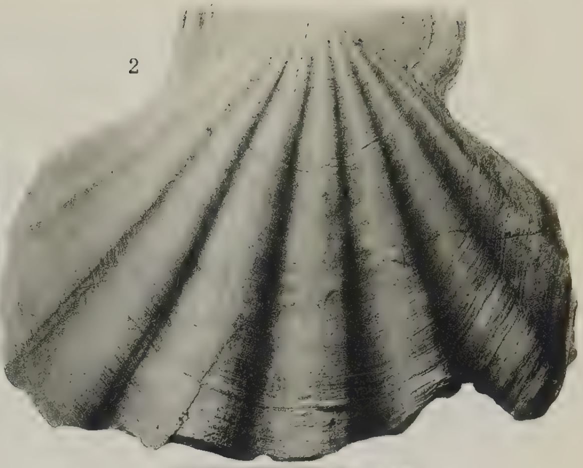
Fig. 3. *Patinopecten kimurai nakosoensis* MASUDA, n. subsp. Holotype, Left valve, ×1. DGS, Reg. No. 1940. Loc. Same as above.

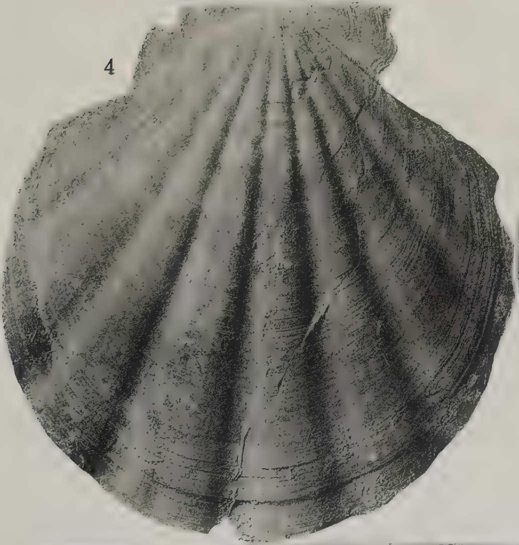
Fig. 4. *Patinopecten kimurai ugoensis* (HATAI and NISIYAMA). Topotype, Right valve, ×1. DGS, Reg, No. 1921. Loc. Ukibuta, Higashi-Yuri-mura, Yuri-gun, Akita Prefecture. Sugota formation.

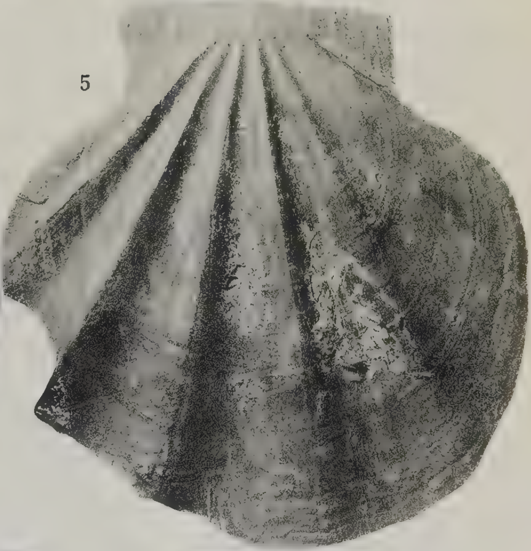
Fig. 5. *Patinopecten kimurai tiganouraensis* (NAKAMURA). Left valve of a plaster-cast, ×3/4. DGS, Reg. No. 3703. Loc. About 500 m. east of the Tohoku Regional Fisheries Research Laboratory, Higashi-Shiogama, Shiogama City, Miyagi Prefecture. Ajiri formation.

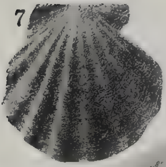
Figs. 6-7. *Patinopecten kimurai murayamai* (YOKOYAMA). 6, Right valve, ×4/5. 7, Right valve, ×1. DGS, Reg. No. 1904. Loc. Kitano, Yasawagi, Ômori-machi, Hiraga-gun, Akita Prefecture. Sugota formation.

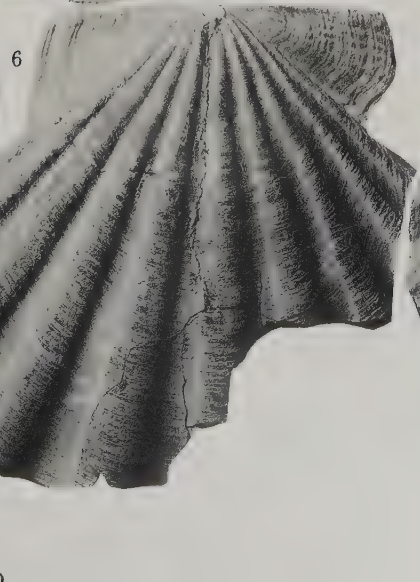

1

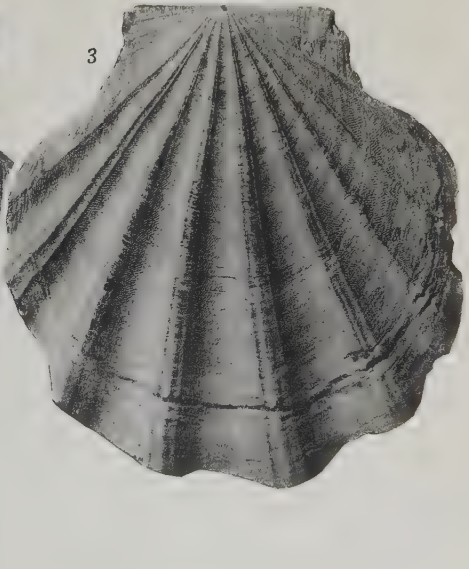

2


4


5


7


6


3

MASUDA photo.

cal Notes on certain Japanese Scallops. *Jour. Geol. Soc. Japan, Vol. 46, No. 544,* pp. 36-47, 3 taxt-figs.

—— and —— (1952), Check List of Japanese Tertiary Marine Mollusca. *Sci. Rep., Tohoku Univ., Ser. 2, Special Vol. No. 3,* pp. 1-464.

KAMADA, Y. (1954), *Patinopecten kobiyamai,* a New Miocene Scallop from the Joban Coal-Field, Japan. *Trans. Proc. Palaeont. Soc. Japan, N.S., No. 15,* pp. 173-178, 1 pl.

KANNO, S. (1955), Tertiary Mollusca from Taishu Mine, Tsushima, Nagasaki Prefecture, Japan. *Ibid.. No. 18,* pp. 31-35, 1 pl.

—— (1957), On Some New Species of *Patinopecten* from the Chichibu Basin, Saitama Prefecture. *Bull. Chichibu Mus. Nat. Hist., No. 7,* pp. 101-108, 3 pls.

MASUDA, K. (1954), Fossil Pectinidae from Fukuoka-machi, Ninohe-gun, Iwate Prefecture. *Saito Ho-on Kai Mus., Res. Bull., No. 23,* pp. 11-14, 3 text-figs.

—— (1955), Fossil Scallops from Yasawagimura, Akita Prefecture, Northeast Honshu, Japan. *Ibid., No. 24,* pp. 18-22.

—— (1958), On the Miocene Pectinidae from the Environs of Sendai; Part 12, On *Pecten kagamianus* YOKOYAMA. *Trans. Proc. Palaeont. Soc. Japan, N.S., No. 32,* pp. 271-284, 2 pls.

NAKAMURA, M. (1940), On Some Pectinidae Fossils from the Miocene Deposits of the Tomiya Block, Miyagi-ken, Northeast Honsyû, Japan. *Japan. Jour. Geol. Geogr., Vol. 17, Nos. 1-2,* pp. 1-15, 2 pls.

NOMURA, S. (1935), Miocene Mollusca from the Nisi-Tugaru District, Aomori-ken, Northeast Honsyû, Japan. *Saito Ho-on Kai Mus., Res. Bull., No. 6,* pp. 19-81, 7 pls.

OTUKA, Y. (1934), Tertiary Structures of the Northwestern End of the Kitakami Mountainland, Iwate Prefecture, Japan. *Bull. Earthq. Res. Inst., Vol. 12, Pt. 3,* pp. 566-639, 7 pls., 1 map.

—— (1936), The Takasegawa Green Tuff Beds of the Yuri District, Akita Pref., Japan and Correlation of the Lower Neogene in Japan. *Ibid., Vol. 14, Pt. 3,* pp. 438-452, 1 pl.

—— (1943), Miocene Mollusca from Iisaka and Manseioozi, Hukusima Prefecture. *Jour. Geol. Soc. Japan, Vol. 50, No. 592,* pp. 221-227, 1 pl.

SUGAI, K., H. MATSUI, S. SAITO, Y. KITAKAWA, M. SASAKI, M. MIYASHITA and K. KAWACHI (1957), Explanatory Text of the Jôban Coal Field, Geological Maps of the Coal Field of Japan 1. *Geol. Surv. Japan,* pp. 1-143, 3 maps.

TOKUNAGA, Y. (1906), Fossils from the Environs of Tokyo. *Jour. Coll. Sci., Imp. Univ. Tokyo, Vol. 21, Art. 2,* pp. 1-96, 6 pls.

YOKOYAMA, M. (1925), Molluscan Remains from the Uppermost Part of the Joban Coal-Field. *Ibid., Vol. 45, Art. 5,* pp. 1-32, 6 pls.

—— (1927), Fossil Mollusca from the Oil-Field of Akita. *Jour. Fac. Sci., Imp. Univ. Tokyo, Sec. 2, Vol. 1, Pt. 9,* pp. 377-387, 2 pls.

## Explanation of Plate 30

Fig. 1. *Patinopecten kimurai yudaensis* Masuda, n. subsp. Holotype, Right valve, ×3/4. DGS, Reg. No. 1936. Loc. Yuda, Kintaichi-mura, Ninohe-gun, Iwate Prefecture. Shiratori formation.

Fig. 2. *Patinopecten kimurai yudaensis* Masuda, n. subsp. Paratype, Left valve, ×3/4. DGS, Reg. No. 1935. Loc. Same as above.

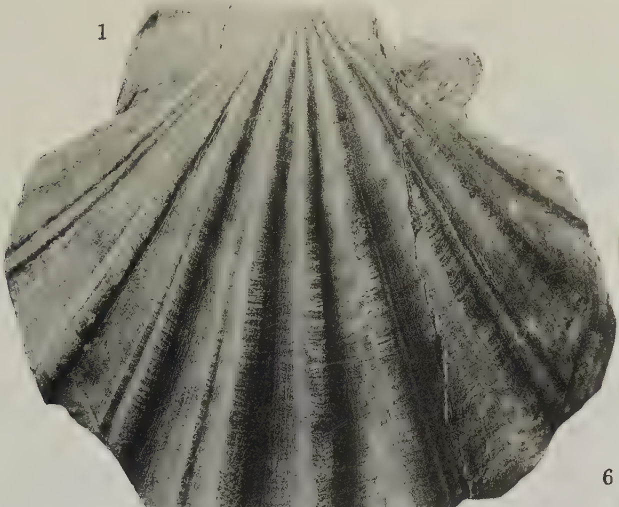
Figs. 3-4. *Patinopecten kimurai murayamai* (Yokoyama). Left valve, ×1. DGS, Reg. No. 1905. Loc. Kitano, Yasawagi, Ômori-machi, Hiraga-gun, Akita Prefecture. Sugota formation.

Fig. 5. *Patinopecten kimurai ugoensis* (Hatai and Nisiyama). Topotype, Left valve, ×3/4. DGS, Reg. No. 1921. Loc. Ukibuta, Higashi-Yuri-mura, Yuri-gun, Akita Prefecture. Sugota formation.

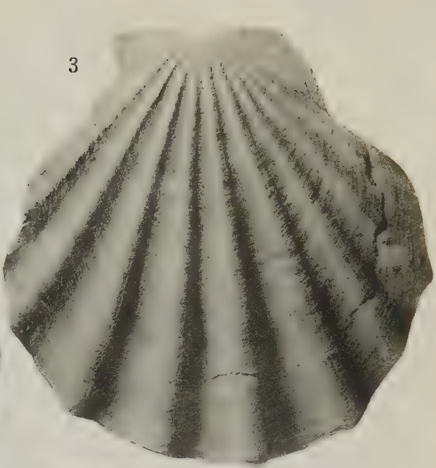
Fig. 6. *Patinopecten kimurai kimurai* (Yokoyama). Topotype, Left valve, ×1. DGS, Reg. No. 3702. Loc. Izura, Ôtsu-machi, Kita-Ibaraki City, Ibaraki Prefecture. Kokozura formation.

Figs. 7-10. *Palliolum* cf *peckhami* (Gabb). 7, 8, Right valve, ×1. 9, 10, Left valve, ×1. DGS, Reg. No. 3704. Loc. About 1.5 km. west of Ishikura, Taiwa-machi, Kurokawa-gun, Miyagi Prefecture. Aoso formation.

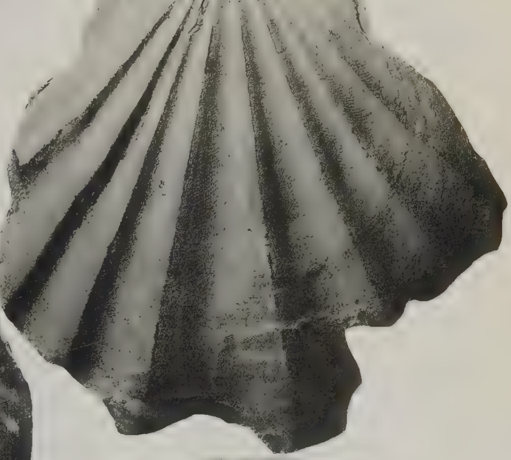
1



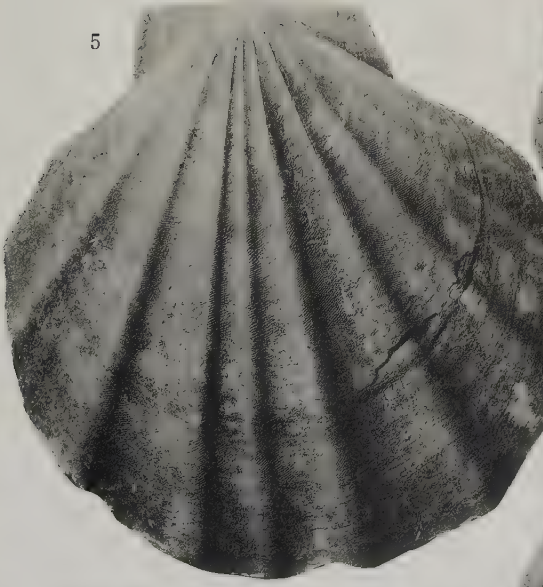
3



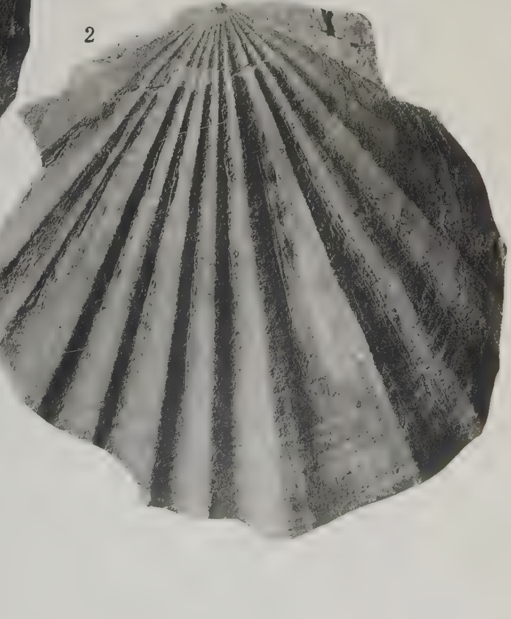
6



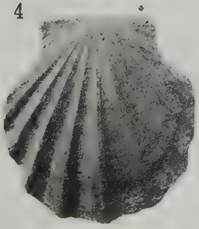
5



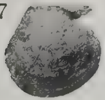
2



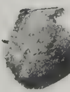
4



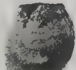
7



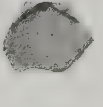
8



9



10



MASUDA photo.

Trans. Proc. Palaeont. Soc. Japan, N. S., No. 38, pp. 263-274, pl. 31, June 1, 1960

# 382. MOLLUSCAN FOSSILS FROM TUNGYÜPING IN THE PENGHU ISLANDS, TAIWAN*

ICHIRÔ HAYASAKA and SHÔZÔ HAYASAKA

Shimane University and Tôhoku University

台湾澎湖諸島東嶼坪産貝化石： 表記産貝化石小動物群を分類記載した。20 種中 *Meretrix deguchii*, *Monilea tungyüpingensis*, *Murex penghuensis*, *Melongea coniformis* は新種で，他の多くは台湾とその近辺の化石或いは現生種である。これら 4 新種の存在は，台湾本島の所謂“苗栗層”の類似動物群との差を示しているように思はれる。　早 坂 一 郎・早 坂 祥 三

Tungyüping is an islet situated in the southernmost part of the Penghu Islands (or Pescadores Islands) in the Formosa Strait about 50 km off the coast of western extremity of the main island of Formosa. The Islands have been considered to be detached blocks of an extended basalt mesa (DEGUCHI, 1912; HAYASAKA, 1948). In the Penghu Islands, there are three basaltic flows alternating with the light brown, medium sandstone beds about 15 meters thick. The uppermost one of these sandstone beds contains, in places, some molluscan fossils, which have long been left behind the paleontological researches. The writers had an opportunity to study some specimens from a reddish brown, more or less conglomeratic sandstone in Tungyüping island, which is considered to be the same horizon as the fossiliferous one stated above. The basaltic flows of the present islands have been considered, together with the intercalating sandstones, to be Pleistocene in age, from the petrographic and topographic points of view, and the age of their eruption is considered to correspond to the younger one (Tatung volcanic activity, HAYASAKA, 1948) of the two volcanic stages observed in the main island of Formosa. The molluscan fossils here dealt with are rather small in number of species, and the writers have not been able to determine their geological age more in detail, but for some difference of the living condition, especially in temperature, between the fauna of the "Byôritsu Beds"[1] in the main island of Formosa and the present one, which may probably be due to the slight difference in the geological age.

The fossils recognized in the material from the present locality are as follows:

*Anadara* (*Scapharca*) *cornea* (REEVE)
*A.* (*S.* ) *satowi* (DUNKER)
*A.* (*Diluvarca?*) *rhombea* (BORN)
*Sunetta menstrualis* (MENKE)
*Meretrix deguchii* HAYASAKA and HAYASAKA, n. sp.
*Dosinia gruneri* PHILIPPI
*Caecella chinensis* DESHAYES
*Anisocorbula scaphoides* (HINDS)

---

* Received May 6, 1959; read at 59th Meeting of the Society, Oct. 9, 1954.

[1] According to HAYASAKA, LIN and YEN (1948), the richly fossiliferous sandstone occupying the upper part of the so-called Byôritsu Beds should be differentiated as the Tsûshô (通宵) formation from the sparsely mammiferous conglomeratic part below which is the Byôritsu formation in the revised sense.

*Monilea tungyüpingensis* HAYASAKA and HAYASAKA, n. sp.
*Umbonium* (*Umbonium*) *vestiarium* (LINNÉ)
*U.* (*U.* ) n. ? sp.
*Architectonica perspectiva* (LINNÉ)
*Cerithidea cingulata* (GMELIN) var.
*Batillaria murayamai* YOKOYAMA
*Cerithium kochi* PHILIPPI
*Sinum neritoideum* (LINNÉ)
*Phalium cancellianum* NOMURA
*Bursa nobilis* (REEVE)
*Murex penghuensis* HAYASAKA and HAYASAKA, n. sp.
*Melongena coniformis* HAYASAKA and HAYASAKA, n. sp.

Among the above-listed species, all of the Recent ones are living under the condition of warm water widely ranging from the Indian Ocean to the coast of Japanese Islands. As a whole, the present fauna most resembles that of the Pliocene "Byôritsu beds" in the main island of Formosa (YOKOYAMA, 1923; NOMURA 1933, 1935). Nine species are found to be common with the latter, that is, *Anadara cornea*, *A. rhombea*, *Dosonia gruneri*, *Umbonium vestiarium*, *Architectonica perspectiva*, *Batillaria murayamai*, *Cerithium kochi*, *Sinum neritoideum* and *Phalium cancellianum*. It is remarkable, however, that *Anadara rhombea* from the present locality has a type of shell different from the specimens of the "Byôritsu beds," and that the other eleven species including four new species are hitherto unknown from the latter formation. Among the new species here described, *Murex penghuensis* and *Melongena coniformis* are noticeable. Namely, the former species has a peculiar outline of shell, and its allied species is known only from the Upper Miocene of Borneo (BEETS, 1941). The latter species has a close alliance to *M. pugilina* living in the Indian Ocean and to *M. madjalengkensis* reported from the Pliocene of Java (MARTIN, 1926). Genus *Melongena* has not been reported to live in the waters ranging from Formosa to Japan, and is known only as one of the index fossils of warm water condition from the Miocene and Pliocene rocks exposed at several localities in Japan (YOKOYAMA, 1924, 1926; KANEHARA, 1937). From the above stated aspects, it seems quite reasonable to say that the living condition of the present fauna might be more or less different from, and probably warmer than that of the "Byôritsu beds", though the general features of them closely resemble each other.

Several years ago, the senior author reported an occurrence of echinoid fossil *Astriclypeus manni* VERRILL, which is smaller in size than the typical specimens, associated with the present molluscan fauna (I. HAYASAKA, 1947). *Astriclypeus manni* is quite frequently found in the uppermost horizon of the "Byôritsu beds" and the remarks on its systematic relations are also given in the above-cited literature. The Recent species has a wide distribution in the central to southwestern part of the Japanese water both of the Pacific and the Japan Sea sides. This species is also recorded to occur in China Sea, but has not been reported from the seas around Formosa. The specimen collected from the present locality has an unusally small test, of which general outline is quite identical with the representative specimens of the normal size. As the collection contains only a single specimen, it is impossible, however, to know whether the small size means a young form or a dwarf.

On the other hand, the relative sizes of the molluscan specimens here dealt with are as follows;

1) species represented by rather small shells than the normal sized specimens: *Anadara rhombea*, *Caecella chinensis*,

*Architectonica perspectiva, Phalium cancellianum, Bursa nobilis,*

2) species represented by rather young specimens: *Anadara cornea, Anadara satowi, Sunetta menstrualis,*

3) species represented by shell slightly larger than the Holotype specimen: *Batillaria murayamai,*

4) new species are rather small in size compared with the average among genera; *Meretrix deguchii, Monilea tungyüpingensis*: 5) the other nine species are of the normal sizes.

From the above stated relations, it can be readily recognized that the present fauna is, as a whole, evidently characterized by the predominant occurrences of young or rather small-sized specimens. On the specimens of *Batillaria murayamai* having slightly larger shell than the Holotype specimen, we can not discuss about its relative size but that it is, at least, an adult specimen, because the present occurrence is the second record of this species, and its average size is far beyond our knowledge. Such a characteristic feature of the molluscan fauna seems to correspond quite well to the associated occurrence of an unusually small echinoid. The present fauna including an echinoid fossil seems, insufficient in number of individuals for concluding that it is a dwarfed fauna. Consequently, the writers wish to refrain from the final decision on this point until further materials will be obtained with informations on their modes of occurrence.

In conclusion the writers wish to acknowledge their great indebtedness to Prof. K. Hatai of the Tôhoku University for his suggestions and aid in identifying the species of this faunule.

## Description of Species

### Genus *Anadara* Gray, 1847

### *Anadara* (*Scapharca*) *cornea* (Reeve), 1844

Plate 31, Figure 1

1844. *Arca cornea* Reeve, *Conch. Icon., Vol. 2, Arca,* pl. 3, fig. 16.
1891. *Arca* (*Scapharca*) *cornea* Kobelt in Martini u. Chemnitz, *Syst. Conch. Cab., Vol. 8, Pt. 2,* p. 167, pl. 42, fig. 5.
1910. *Arca* (*Scapharca*) *cornea* Martin, *Foss. von Java, Samml. geol. Reichs-Mus. Leiden. N. S. Vol. 1, Pt. 2,* p. 379, pl. 54, figs. 118–120.
1920. *Arca* (*Scapharca*) *cornea* Tesch, *Paläont. von Timor, Vol. 8,* p. 96, pl. 138 (20), fig. 256.
1933. *Arca* (*Arca*) *cornea* Nomura, *Sci Rep. Tôhoku Imp. Univ., Ser. 2 (Geol.) Vol. 16,* p. 34. pl. 3, fig. 15.

Two young, well preserved left valves of this species are in the collection.

*Dimensions* (*in mm*):—Height 15.6, length 18.5 and height 16.5, length 19.1 respectively.

*Repository*:—IGPS coll. cat. no. 77508.

*Living:*—Southern Kyûshû; Ryûkyû Islands; Formosa; the Philippines (Samar Island is the type locality); Indian Ocean.

*Geologic distribution*:—Pleistocene of the Ryûkyû Islands; Pliocene of Formosa; Pliocene and post-Pliocene of Java; Pliocene of Formosa; Pliocene and post-Pliocene of Java; Pleistocene of Timor.

### *Anadara* (*Scapharca*) *satowi* (Dunker)

Plate 31, Figure 2

1882. *Scapharca satowi* Dunker, *Index Moll.* p. 233, pl. 9, figs. 1, 2, 3.
1891. *Arca* (*Anomalocardia*) *satowi* Kobelt in Martini u, Chemnitz, *Syst. Conch. Cab., Vol. 8, Pt. 2,* p. 58, pl. 17, figs. 1, 2.
1911. *Anadara* (*Scapharca*) *satowi* Yamakawa, *Jour. Geol. Soc. Tokyo, Vol. 18, No. 209,* p. 12, pl. 4, figs. 14, 15; pl. 5, figs. 5, 6; pl. 7, fig. 6

A single right valve, lacking a small area of the posterior ventral corner, is in the collection. In general outline, the present specimen seems to be slightly different from the full-grown ones of this species, but this difference is considered an individual variation, as is clear by comparing its younger part.

*Dimensions* (*in mm*):—Height ca. 53, length 60.0, depth ca. 20.7.

*Repository*:—IGPS coll. cat. no. 77509.

*Living*:—Coast of Noto Peninsula, Japan; Pacific coast of central to southwest Japan.

*Geologic distribution*:—Pleistocene of central Japan.

### *Anadara* (*Diluvarca*?) *rhombea* (BORN), 1778

Plate 31, Figures 3a–b

1844. *Arca rhombea* REEVE, *Conch. Icon., Vol. 2, Arca*, pl. 2, fig. 12.
1891. *Arca* (*Anomalocardia*) *rhombea* KOBELT in MARTINI u. CHEMNITZ, *Syst. Conch. Cab., Vol. 8, Pt. 2*, p. 39, pl. 3, figs. 2, 3; p. 57, pl. 16, figs. 5, 6.
1910. *Arca* (*Anadara*) *rhombea* MARTIN, *Foss. v. Java, Sam. g. Reichs-Mus. Leiden, N. S. Vol. 1, Pt. 2*, 368, pl. 52, figs. 89–92.
1933. *Arca* (*Arca*) *rhombea* NOMURA, *Sci. Rep. Tohoku Imp. Univ., Ser. 2* (*Geol.*), *Vol. 16*, p. 37, pl. 4, fig. 13.

Several well preserved specimens of rather small size are in the collection. Shell very thick, quadrate in outline, equivalve, heart-shaped in lateral view, inequilateral, posterior side angularly contracted at the upper part, and rounded below. Umbones prominent, very erect, rather remote from each other, beak more or less incurved and directed anteriorly; ligamental area broad, arcuately trigonal in profile, sculptured with two or three cheveron-shaped grooves. Radial ribs 25–27, rather narrow, rounded, anterior ribs nodulous, ribs behind the contracted angle are slightly broader than flattened interspaces.

Two spacimens are illustrated by KOBELT. One is large and very thick (KOBELT, *op. cit.* p. 39, pl. 3, figs. 2, 3), the other one is small, probably rather thin and with a more compressed shell (KOBELT, *op. cit.* p. 57, pl. 16, figs. 5, 6; MARTIN, *op. cit.*). The present specimens belong to the former type. This species has been already reported from the "Byôritsu beds" by NOMURA, but his specimen is represented by KOBELT's second type.

| *Dimensions*:— | Height | Length | Depth | Valve |
|---|---|---|---|---|
| 1. | 38.9 mm | 41.8 | 17.2 | left |
| 2. | 34.3 | 33.5 | 15.2 | right |
| 3. | 34.1 | 35.7 | 15.3 | left |
| 4. | 31.8 | 34.9 | 14.7 | right |
| 5. | 28.6 | 31.0 | 13.1 | left |
| 6. (illustrated) | 28.5 | 30.4 | 13.6 | left |

*Repository*:—IGPS coll. cat. no. 77510.

*Living*:—Indian Ocean to China Sea.

*Geologic distribution*:—Pliocene of Java; Pliocene of Formosa (represented by rather small and more compressed form).

## Genus *Sunetta* LINK, 1807

### *Sunetta* (*Cyclosunetta*) *menstrualis* (MENKE), 1843

Plate 31, Figure 4

1855. *Meroe excavata* SOWERBY, *Thes. Conch., Vol. 2*, p. 610, pl. 126, figs. 13, 14.
1855. *Meroe menstrualis* SOWERBY, *Thes. Conch., Vol. 2*, p. 742, pl. 163, fig. 17.
1864. *Meroe excavata* REEVE, *Conch. Icon., Vol. 14, Meroe*, pl. 3, fig. 11.
1864. *Meroe menstrualis* REEVE, *Conch. Icon., Vol. 14, Meroe*, pl. 3. fig. 9.
1864. *Sunetta menstrualis* RÖMER, *Monogr. Venus, Vol. 2*, p. 13, pl. 4, fig. 2.
1869. *Sunetta excavata* PFEIFFER, *Syst. Conch. Cab., Vol. 11, Pt. 1*, p. 83, pl. 29, fig. 4.
1869. *Sunetta menstrualis* PFEIFFER, *Syst.*

*Conch. Cab., Vol. 11, Pt. 1,* p. 85, pl. 29, figs. 10, 11, 12.
1922. *Sunetta excavata* YOKOYAMA, *Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 44, Art. 1,* p. 147, pl. 11, figs. 6, 7, 8.

Two right valves of young individuals are in the collection. Both of them are flat and exceedingly equilateral.

*Dimensions* (*in mm*)*:*—Height 18.7, length 22.3, depth 4.4.

*Repository:*—IGPS coll. cat. no. 77511.

*Living:*—Pacific coast of central to southwest Japan: South Australia. New Holland.

*Geologic distribution:*—Pleistocene of central Japan.

### Genus *Meretrix* LAMARCK,

### *Meretrix deguchii* HAYASAKA and HAYASAKA, n. sp.

Plate 31, Figures 8a–b

*Description*—Shell small, roundly rhombic, inequilateral. Anterior end rounded, posterior one roundly angulated. Dorsal margin sloping with nearly straight curve, and about equal in length both anteriorly and posteriorly. Ventral margin arcuate but strongly biassed anteriorly, nearly straight in the posterior half, and arcuate in the anterior. Beak small, pointed. Surface smooth, with obsolete concentric colour markings and fine feeble growth lines. Hinge narrowly arcuate, bearing three cardinal teeth and an anterior lateral, posterior cardinal being bifid, arrayed with numerous filelike denticulations. Pallial sinus inaccessible in both specimens. Inner margin smooth.

*Dimensions* (*in mm*)*:* — Height 13.5, length 15.3, depth 4.0.

*Repository:*—IGPS coll. cat. no. 77512 (Holotype) and no. 77513 (Paratype).

*Remarks:*—The present species somewhat resembles *Meretrix meretrix* (LINNÉ), reported by YOKOYAMA (1928) from the "Byôritsu beds" of Formosa, in having a relatively short shell. However, it differs from the latter species in having rounded anterior and roundly angulate posterior ends, and markedly biassed ventral margin. Two small left valves are in the collection.

### Genus *Dosinia* SCOPOLI, 1777

### *Dosinia gruneri* PHILIPPI, 1845

Plate 31, Figure 6

1845. *Cytherea* (*Artemis*) *gruneri* PHILIPPI, *Abbild. u. Beschr., Vol. 3,* p. 23, pl. 8, fig. 2.
1851. *Artemis gruneri* REEVE, *Conch. Icon., Vol. 6, Artemis,* pl. 5, fig. 31.
1928. *Dosinia gruneri* YOKOYAMA, *Imp. Geol. Surv. Japan, Report No. 101,* p. 74, pl. 7, fig. 3.

Two specimens, one well preserved and the other exceedingly water worn, are examined. This species was already reported by YOKOYAMA and by NOMURA from the Pliocene "Byôritsu beds" of the main island of Formosa.

*Dimensions* (*in mm*)*:* — Height 30.9, length 31.1, depth 8.4.

*Repository:*—IGPS coll. cat. no. 77514.

*Living:* — West coast of Formosa; China Sea.

*Geologic distribution:* — Pliocene of Formosa.

### Genus *Caecella* GRAY, 1853

### *Caecella chinensis* DESHAYES, 1855

Plate 31, Figure 7

1920. *Ervillia otsuensis* YOKOYAMA, *Jour. Coll. Sci. Tokyo Imp. Univ., Vol. 39* (*6*), p. 109, pl. 7, figs. 21, 22.

*Dimensions* (*in mm*)*:*—Height 8.70, length 11.00, depth 3.10.

*Repository:*—IGPS coll. cat. no. 77515.

*Living:*—Northern, central and western Japan to Formosa.

*Geologic distribution:*—Pleistocene of central Japan.

### Genus *Anisocorbula* IREDALE, 1930

### *Anisocorbula scaphoides* (HINDS), 1843

Plate 31, Figure 5

1844. *Corbula scaphoides* REEVE, *Conch. Icon., Vol. 3, Corbula,* sp. 24.
1949. *Anisocorbula scaphoides* KURODA, *Illust. Cat. Japan. Shells, Vol. 1,* p. 3. pl. 1, figs. 13, 14.

A single, rather well preserved right valve is in the collection. The Recent distribution of this species widely ranges in the Indo-Pacific region, and the specimens have been reported to be living in the Hôko i. e., the Penghu Islands, Formosa, by KURODA (1941).

*Repository:*—IGPS coll. cat. no. 77516.

*Living:*—Centr. and west. Japan; Penghu Islands: the Philippines; Singapore.

### Genus *Monilea* SWAINSON, 1840

### *Monilea tungyüpingensis* HAYASAKA and HAYASAKA, n. sp.

Plate 31, Figures 17a-c

*Description:*—Shell rather thick, high, spirally striated, trochoid with convex base; whorls about 4, slightly convex, separated by impressed suture. Protoconch consisting of about one and a half smooth whorls. The sculpture of the succeeding 3 whorls consisting of 3 strong spiral ridges separated by wider interspaces; on the body whorl, 3 feeble ridges are added, one on the subsutural zone and 2 on the rounded periphery. Whole surface of the body whorl covered with fine oblique growth lines extending to the margin of umbilicus. Base convex, smooth, without spirals. Umbilicus narrow and deep, of which the inner surface is spirally sculptured. Aperture roundly square, rather small, about one third of the entire spire in height.

*Dimensions (in mm):*—Height 10.05, diameter 10.75.

*Repository:*—IGPS coll. cat. no. 77517.

*Remarks:*—As to the generic determination of this species, the writers have a slight doubt. The present specimen, in reality, has some characters identifiable with those of some subgenera of the genus *Gibbula*, but the writers are more strongly inclined to consider it a new species of the genus *Monilea* in the general aspects observed in the specimen. It is the only material of this species at the authors' hand, and is easily distinguished from allied species by its smooth base and rather trochoid than turbinate shell form.

### Genus *Umbonium* LINK, 1807

### *Umbonium (Umbonium) vestiarium* (LINNÈ), 1758

Plate 31, Figure 11

1889. *Umbonium vestiarium* PILSBLY in TRYON, *Man. Conch., 1 Ser., Vol. 11,* p. 450, pl. 58, figs. 1-8.
1935. *Umbonium (Umbonium) vestiarium* NOMURA, *Sci. Rep. Tohoku Imp. Univ., Vol. 18,* p. 213, pl. 10, figs. 26a, 26b.

Two imperfect specimens of *Umbonium* having slightly depressed whorls with smooth surface are in the collection. They are readily identified with *U. vestiarium* (LINNÉ) in general respects.

*Dimensions (in mm) of the larger specimen:*—Height 5.6, diameter 10.2 (long) and 8.6 (short).

*Repository:*—IGPS coll. cat. no. 77515.

*Living:*—Formosa; the Philippines; Singapore; Java; Indian Ocean (Type locality).

*Geologic distribution:*—Pliocene of Formosa.

### *Umbonium* (*Umbonium*) n. sp. ?

Plate 31, Figures 18a–c

*Description:*—Two imperfect specimens are in the collection. Regarding some characters, namely, the spinose subsutural band, convex base and high shell outline, among others, the present species somewhat resembles *Umbonium* (*Suchium*) *suchiense obsoletum arenarium* MAKIYAMA (SUGIYAMA, 1935) and living *Umbonium* (*Suchium*) *moniliferum* (LAMARCK). But it apparently differs from the latter two species in having no spiral striae on its smooth shell surface and a simple callus pad which is the most important characteristic of the subgenus *Umbonium s. str.*, among which the writers could find no identifiable species. The specimens are, however, too poor in preservation to be discriminated as a new species. The following are diagnoses shown of the present problematical specimens.

Shell moderate in size, conical with convex base; whorls 4, younger 3 convex, the last one slightly concave under the suture. Protoconch consisting of about one and a half whorls, depressed, smooth. Surface smooth, with fine oblique incremental lines and subvertical zigzag colour markings, closely set side by side between the suture and the margin of callus pad. Subsutural band elevated and cord-like, conspicuously spinose. Spines high and pointed, triangularly tapering in lateral view, about 10 on the last whorl, becoming feeble towards the younger whorls. Aperture roundly square, higher than one half of the entire height of the shell. Body whorl rounded at the periphery, base convex, smooth, with obsolete radiating incremental lines. Callus pad smooth, simple, circular and remarkably thick, about half of the base in diameter.

*Dimensions* (*in mm*) *of the larger specimen:*—Height ca. 9.00, diameter ca. 11.15, length of aperture ca. 5.35.

*Repository:*—IGPS coll. cat. no. 77519.

## Genus *Architectonica* RÖDING, 1798

### *Architectonica perspectiva* (LINNÉ), 1758

Plate 31, Figure 9

1835. *Solarium perspectivum* KIENER, *Spec. coq. viv., Solarium*, p. 3, pl. 1, fig. 1.
1864. *Solarium perspectivum* REEVE, *Conch. Icon., Vol. 15, Solarium*, pl. 2, figs. 11a, b.
1866. *Solarium perspectivum* SOWERBY, *Thes. Conch., Vol. 3*, p. 228, pl. 4, figs. 36, 37, 38.
1869. *Solarium perspectivum* LISCHKE, *Jap. Meer.-Conch., Vol. 1*, p. 79; *Vol. 2*, p. 73.
1882. *Solarium perspectivum* DUNKER, *Ind. Moll. Mar. Jap.*, p. 92.
1887. *Solarium perspectivum* TRYON, *Man. Conch, 1 Ser., Vol. 9*, p. 8, pl. 2, figs. 18–21.
1895. *Solarium perspectivum* PILSBRY, *Cat. Mar. Moll. Japan*, p. 65.
1906. *Solarium perspectivum* MARTIN, *Foss. von Java, Samml. geol. Reichs-Mus. Leiden, N. S. Vol. 1*, p. 246, pl. 37, figs. 594–597.
1920. *Solarium perspectivum* TESCH, *Paläont. Timor, Vol. 8*, p. 65, pl. 132, fig. 200.
1928. *Solarium perspectivum* YAKOYAMA, *Imp. Geol. Surv. Japan, Report No. 101*, p. 62, pl. 5, fig. 7.
1935. *Architectonica perspectiva* NOMURA, *Sci. Rep. Tohoku Imp. Univ., Ser. 2* (*Geol.*), *Vol. 18*, p. 194, pl. 9, fig. 41.

Two rather small specimens of this species are in the collection. According to REEVE, the characteristic features of this species are as follows:

"Whorls smooth in the middle, spirally linearly grooved above and below, obliquely rather distantly, impressly striated throughout, base and margin of the umbilicus articulated with dark-brown."

*Dimensions (in mm) of the larger specimen:*—Height 6.7, diameter 16.0.

*Repository:*—IGPS coll. cat. no. 77520.

*Living:*—Western Japan; Ryûkyû islands; Penghu islands; China; Manila; Molucca islands; Indian Ocean; Australia.

*Geologic distribution:*—Pleistocene of the Ryûkyû islands; Pliocene of Formosa; Post-Pliocene and Pliocene of Timor; Pliocene and Miocene of Java.

### Genus *Cerithidea* SWAINSON, 1840

### *Cerithidea cingulata* (GMELIN), var.

Plate 31, Figure 16

A single, somewhat water worn, imperfect specimen is in the collection. Ribs of the present specimen are more or less oblique and fewer in number than in GMELIN's species. According to NOMURA (1935), the named species "appears in Japan dating from the Middle Miocene epoch. As Recent it has a wide geographical distribution ranging from Northern to Southern Japan; also Indo-Pacific and Australia."

*Dimensions (in mm):*—Height ca. 28.0, diameter 8.75.

*Repository:*—IGPS coll. cat. no. 77521.

### Genus *Batillaria* BENSON, 1842

### *Batillaria murayamai* YOKOYAMA, 1928

Plate 31, Figure 12

1928. *Potamides (Batillaria) murayamai* YOKOYAMA, *Imp. Geol. Surv. Japan, Report No. 101*, p. 53, pl. 4, figs. 5, 6.

Three specimens, slightly larger than the holotype, are examined. They are closely similar to the named species in general outline, but the spiral cords have a tendency to become more differentiated on the body-whorl. Namely, each spiral cord is accompanied by one or two weaker spirals below. The original description is as follows:

"Shell moderate in size, many whorled. Whorls somewhat convex with sutures distinct. Longitudinally plicate and spirally corded. Plicae coarse, rounded, mostly vanishing near the lower suture, although occasionally reaching it, strongest in the middle of the whorls, about ten in number on the body-whorl. Spiral cords often tuberculous. Periphery rounded. Base convex with several spiral cords like those of the whorls. Aperture roundish, provided with a posterior canal."

This species is closely allied to *Batillaria zonalis* (BRUGUIÈRE), which is a common living species in Japan, but is easily distinguishable therefrom by the strongly acuminated spire and thinner inner lip.

| *Dimensions:*— | | Height | Diameter |
|---|---|---|---|
| 1. | (illustrated) | 42.0 mm | 12.7 |
| 2. | | 41.5 | ? |
| 3. | | 36.3 | 12.1 |

*Repository:*—IGPS coll. cat. no. 77522.

*Living:*—Unknown.

*Geologic distribution:*—Pliocene of Formosa (Type locality).

### Genus *Cerithium* BRUGUIÈRE, 1792

### *Cerithium kochi* PHILIPPI, 1848

Plate 31, Figure 15

1951. *Cerithium kochi* PHILIPPI, *Abbild. u. Beschr., Vol. 3, Cerithium,* p. 2, pl. 1, fig. 3.

1922. *Cerithium kochi* YOKOYAMA, *Jour. Coll. Sci. Tokyo Imp. Univ., Vol. 44, Art. 1,* p. 71, pl. 3, fig. 13.

Three specimens, all lacking their body whorls and apices. The whorls are ornamented with five, close, flat, spiral ribs which are alternately large and small and closely tuberculated. The columella-fold is single, oblique, and strong.

*Dimensions* (*in mm*) *of rather perfect specimens*:—Height 38.5, diameter 12.2.

*Repository*:—IGPS coll. cat. no. 77523.

*Living*:—Northern to western Japan; the Ryûkyû islands; Formosa; the Philippines; Indian Ocean; east coast of Africa (Type locality).

*Geologic distribution*:—Post-Pleistocene and Pleistocene of central Japan; Pliocene of the Ryûukyû islands; Pliocene of Formosa.

### Genus *Sinum* Röding, 1798

### *Sinum neritoideum* (Linné), 1758

Plate 31, Figure 14

1833. *Sigaretus neritoideus* Weinkauff in Martini u. Chemnitz, *Syst. Conch. Cab.*, *Vol. 6*, *Pt. 1*, p. 18, pl. 3, figs. 7-11.
1864. *Sigaretus neritoideus* Reeve, *Conch. Icon.*, *Vol. 15*, "*Sigaretus*", pl. 1, fig. 5.
1886. *Sigaretus neritoideus* Tryon, *Man. Conch.*, *1 Ser.*, *Vol. 8*, p. 55, pl. 22, fig. 35.
1887. *Sigaretus neritoideus* Sowerby, *Thes. Conch.*, *Vol. 5*, p. 40, pl. 44. fig. 1; pl. 2, figs. 16, 17.
1935. *Sinum neritoideum* Nomura, *Sci. Rep. Tohoku Imp. Univ.*, *Ser. 2* (*Geol.*), *Vol. 18*, p. 205, pl. 9, figs. 26a, 26b.

A single specimen is referred to the named species, which is reported by S. Nomura from the "Byôritsu beds" in the above cited literature.

*Dimensions* (*in mm*):—Diameter 36.8 (long) and 26.5 (short).

*Repository*:—IGPS coll. cat. no. 77524.

*Living*:—The Philippines; East Indies.

*Geologic distribution*:—Pliocene of the Ryûkyû islands; Pliocene of Formosa.

### Genus *Phalium* Link, 1807

### *Phalium cancellianum* Nomura, 1935

Plate 31, Figure 13

1935. *Phalium cancellianum* Nomura, *Sci. Rep. Tohoku Imp. Univ.*, *Ser. 2* (*Geol.*), *Vol. 18*, p. 169, pl. 8, figs. 25a, 25b.

A single, rather small specimen, which is slightly water worn, is referred to the named species. Though the ribs disappear on the part of the body-whorl, the peculiar cancellated sculpture of this species is distinctly observed on the portion behind aperture and the younger whorls. The punctate-corrugations on the lower part of the inner lip are also distinct.

This species more or less resembles *Phalium strigatum* (Gmelin), a living species in the tropical to subtropical region of Asia.

*Dimensions* (*in mm*):—Height ca. 30.0, diameter 21.5, length of aperture 27.4.

*Repository*:—IGPS coll. cat. no. 77525.

*Living*:—Unknown.

*Geologic distribution*:—Pliocene of Formosa (Type locality).

### Genus *Bursa* Röding, 1798

### *Bursa nobilis* (Reeve), 1843

Plate 31, Figure 10

1843. *Ranella nobilis* Reeve, *Conch. Icon.*, *Vol. 2*, *Ranella*, pl. 4, fig. 16.
1899. *Ranella nobilis* Martin, *Samml. Geol. Reichs-Mus. Leiden*, *N. S. Vol. 1*, pp. 146-147, pl. 23, figs. 340-342.
1920. *Ranella* (*Bursa*) *nobilis* Tesch, *Paläont. von Timor*, *Vol. 8*, p. 41, pl. 79, fig. 153.

A single, rather small specimen is referred to the named species. Although the body whorl is preserved as a mould, the acuminated spire, radiately starred narrow varices and granulously ridged whorls are the characteristics of the present specimen as well as of the species in general.

*Dimensions (in mm)*:—Height 51.2, diameter ca. 35.9.

*Repository*:—IGPS coll. cat. no. 77526.

*Living*:—Pacific Coast of central Japan: Ryûkyû islands; the Philippines.

*Geologic distribution*:—Pliocene of Timor; Pliocene and Miocene of Java; Pleistocene of the Ryûkyû islands.

### Genus *Murex* LINNÉ, 1758

### *Murex penghuensis* HAYASAKA and HAYASAKA, n. sp.

Plate 31, Figures 19a-c.

*Description*: — Shell ovate-pyriform, thick and stout, slightly higher than wide, whorls provided with longitudinal riblets and spiral threads, the former stronger than the latter. Whorls about seven, rapidly increasing in size, spiral threads increasing and axials becoming stronger with addition of whorls. Postnuclear whorls mostly lost, one volution preserved, smooth and rounded, with incipient longitudinals at its lowermost part. Second post-nuclear whorl with axial riblets, narrower than its interspaces which are without spiral threads, or with incipient development at its lower half. Third whorl with expanded shoulders formed of strong axials slightly narrower than their interspaces which are provided with several spiral threads; separated from second and fourth whorls by shallow sutures. Fourth whorl with four spiral threads on shoulder which is delimited by strong axials, with three to four spiral threads on its lower part. Fifth whorl with many spiral threads on shoulder above axial ribs forming short spine-like shoulder; eight spiral threads on and below projecting shoulder, delimited by shallow suture. Sixth or body whorl with eight strong, projecting, axial or longitudinal riblets, becoming spine-like at shoulder; each axial about as wide as its interspaces. Smaller and tubercle-like projections formed below projecting spine-like shoulder. Body whorl covered with spiral threads, which become stronger on basal part, and appear as ridges on last axial. Five axials of last whorl converging into basal part, fusing, then flaring outwards posteriorly; last axial also converging downwards, then continuing into curved canal of which it forms a part. Aperture ovate, inner lip rather thick, slightly callous; outer lip weakly denticulate, thick. Columella short. Canal partly open, recurved, oblique, rather long.

*Dimensions (in mm)*:—Height 52.4, diameter 41.5, height of aperature 20.6, length of canal 18.6.

*Repository*:—IGPS coll. cat. no. 77527 (Holotype).

*Remarks*:—This new species more or less resembles *Murex ardjunoi* BEETS (1941) from the Upper Miocene of Borneo, but can be distinguished therefrom by the more elevated spire which consists of more angulated step-like whorls, and by the more strongly developed fasciole and canal. Also the axials of the present species are stronger and more outstanding.

### Genus *Melongea* SCHUMACHER, 1817

### *Melongena coniformis* HAYASAKA, and HAYASAKA, n. sp.

Plate 31, Figures 20a-c

*Description*:—Shell of medium size, thin, pyriform, rather low-spired. Spire conic, five preseved, body whorl separated from preceding one with canalicular suture, other whorls separated with more or less fused sutures. Nuculear whorls lost. Postnuclear whorls four, of which first is rather smooth, without defined shoulders or spiral sculpture. Second preserved whole with rounded shoulders, rather straight sides, and incipient beads at its lower part just above suture. Third whorl with shoulders defined by small tubercles, which grow into spine-like projections on body whorl; area above shoulders rather flat, rather abruptly ascending into suture. Body whorl separated from third by canaliculate suture, which is deep and rather narrow; its shoulders characterized by spine-like projections; area above shoulders more or less concave. Spine-like projections of body whorl becoming higher and stronger towards aperture, where they are separated by much narrower interspaces. Body whorl covered with numerous, close-set, spiral threads, narrower than their interspaces, forming a net-work with longitudinal threads. Outer lip partly broken, not very thick. Inner lip covered with rather thick callus. Aperture elongately ovate, provided at its uppermost part with upturned posterior canal. Anterior canal rather wide. Columella stout.

*Dimensions* (*in mm*):—Height 59.0, diameter 41.2 (maximum) and 30.8 (minimum), length of aperture 43.1.

*Repository*:—IGHP coll. cat. no. 77599 (Holotype).

*Remarks*:—Among the known species of the genus, *Melongena pugillina* (BORN), a Recent species from the Indian Ocean, resembles the present new species, which, however, can be distinguished therefrom by the higher spire, more regularly developed tubercules on the shoulders and by the more elongate body whorl.

This species is also similar to *Melongena madjalengkensis* MART. reported by MARTIN (1926) from the Pliocene of Java. *M. mdjalengkensis*, which is regarded as a direct ancester of *M. pugillina* by the original author, differs from the present species in having a canaliculate suture not so strongly as of the latter, rather flat or slightly concave shelf, and projections more regularly developed and rather roundly topped.

## References

BEETS, C. (1941), Eine jungmiocäne Mollusken-Fauna von der Halbinsel Mangkalihat, Ost-Borneo. *Verhandel. van het Geologisch-Mijnbouwkundig Genootschap voor Nederlanden Kolonier, Geol. Ser., Deel 13.*

DEGUCHI, Y. (1912), Report on the Geology of the Hôko (Penghu) Islands (in Japanese). *Published by the Government-General of Formosa.*

HAYASAKA, I. (1947), Notes on some Fossil Echinoids of Taiwan, III. *Acta Geologica Taiwanica, vol. 1, no. 2,* pp. 118-119.

—— (1948), An Outline of the Geology and Geography of Taiwan. *Hsueh i tsa chih,* Nanking (南京. 学芸雑誌) *vol. 18, no. 6,* pp. 11-22.

——, LIN, C. C. and YEN, T. P. (1948), An Outline and some Problems of the Stratigraphy of Taiwan. *Acta Geologica Taiwanica, vol. 2, no. 1.*

KANEHARA, K. (1937), On some Neogene Shells from Japan, Part 1. *Jour. Geol. Soc. Japan, vol. 44, no. 527,* pp. 781-785.

KURODA, T. (1941), A Catalogue of Molluscan Shells from Taiwan (Formosa), with Descriptions of New Species. *Mem. Fac. Sci. & Agri., Taihoku Imp. Univ., vol. 22, no. 4,* pp. 65-216.

MARTIN, K. (1926), Pliocene versteeningen van Cheribon in Java. *Wetenschappelijke Mededeelingen, no. 4,* pp. 1-23.

NOMURA, S. (1933), Catalogue of the Tertiary and Quaternary Mollusca from the Island of Taiwan (Formosa) in the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai, Part 1. Pelecypoda. *Sci. Rep. Tohoku Imp. Univ., ser. 2, vol. 16*, pp. 1-108.

—— (1935a), *ditto*, Part 2. Scaphopoda and Gastropoda. *Sci. Rep. Tohoku Imp. Univ., Ser. 2, vol. 18*, pp. 53-228.

—— (1935b), Miocene Mollusca from Siogama, Northeast Honshû, Japan. *Saito Ho-on Kai Mus. Res. Bull., no. 6*, pp. 193-234.

SUGIYAMA, T. (1935), On the Variation of the Shells of Living and Fossil *Umbonium* from Japan, and its Evolution, Part 2. *Jour. Geol. Soc. Japan, vol. 42, no. 503*, pp. 449-482.

YOKOYAMA, M. (1924), Tertiary Fossils from Kii. *Japan. Jour. Geol. & Geogr., vol. 2, no. 3*, pp. 47-58.

—— (1926), Tertiary Mollusca from Southern Tôtômi. *Jour. Fac. Sci., Imp. Univ. Tokyo, Sec. 2, vol. 1, pt. 9*, pp. 313-364.

—— (1928), Mollusca from the Oil-Field of the Island of Taiwan. *Imp. Geol. Surv. Japan, Report no. 101*, pp. 1-112.

## Explanation of Plate 31

(All figures in natural size unless otherwise stated.)

Fig. 1. *Anadara (Scapharca) cornea* (REEVE), IGPS*) coll. cat. no. 77508.

Fig. 2. *Anadara (Scapharca) satowi* (DUNKER), IGPS coll. cat. no. 77509.

Figs. 3a b. *Anadara (Diluvarca?) rhombea* (BORN), IGPS coll. cat. no. 77510. Left valve, a. inner side, b. outer side.

Fig. 4. *Sunetta menstrualis* (MENKE), IGPS coll. cat. no. 77511.

Fig. 5. *Anisocorbula scaphoides* (HINDS), IGPS coll. cat. no. 77516. ×3.

Fig. 6. *Dosinia gruneri* PHILIPPI, IGPS coll. cat. no. 77514.

Fig. 7. *Caecella chinensis* DESHAYES, IGPS coll. cat. no. 77515.

Figs. 8a-b. *Meretrix deguchii* HAYASAKA and HAYASAKA, n. sp. Holotype, IGPS coll. cat. no. 77512. Left valve, a. outer side, b. inner side.

Fig. 9. *Architectonica perspectiva* (LINNÉ), IGPS coll. cat. no. 77520.

Fig. 10. *Bursa nobilis* (REEVE), IGPS coll. cat. no. 77526.

Fig. 11. *Umbonium (Umboaium) vestiarium* (LINNÉ), IGPS coll. cat. no. 77518.

Fig. 12. *Batillaria murayamai* YOKOYAMA, IGPS coll. cat. no. 77522.

Fig. 13. *Phalium cancellianum* NOMURA, IGPS coll. cat. no. 77525.

Fig. 14. *Sinum neritoideum* (LINNÉ), IGPS coll. cat. no. 77524.

Fig. 15. *Cerithium kochi* PHILIPPI, IGPS coll. cat. no. 77523.

Fig. 16. *Cerithidea cingulata* (GMELIN), var., IGPS coll. cat. no. 77521.

Figs. 17a-c. *Monilea tungyüpingensis* HAYASAKA and HAYASAKA, n. sp. Holotype, IGPS coll. cat. no. 77517, a. lateral view, b. basal view, c. apical view.

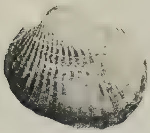
Figs. 18a-c. *Umbonium (Umbonium)* n.? sp., IGPS coll. cat. no. 77519, a. lateral view, b. apical view, c. basal view.

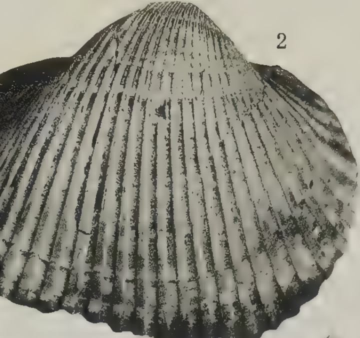
Figs. 19a-c. *Murex penghuensis* HAYASAKA and HAYASAKA, n. sp. Holotype, IGPS coll. cat. no. 77527, a. lateral view, b. apical view, c. apertural view.

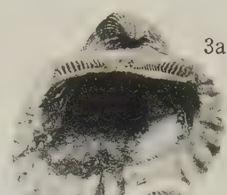
Figs. 20a-c. *Melongena coniformis* HAYASAKA and HAYASAKA, n. sp. Holotype, IGPS coll. cat. no. 77599, a. lateral view, b. apical view, c. apertural view.

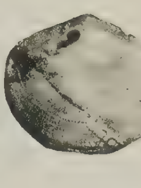
---

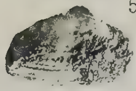
*) Abbreviation for Institute of Geology and Paleontology, Tohoku University, Sendai.

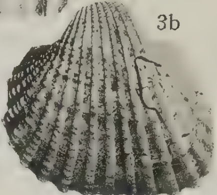

1


2

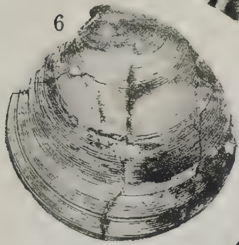

3a

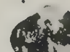

4

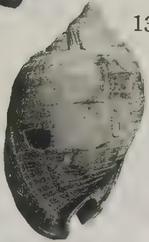

5

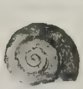

3b

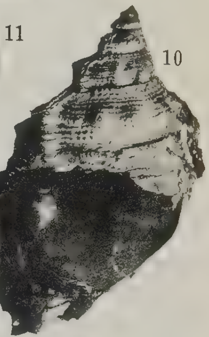
9

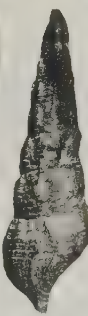

6

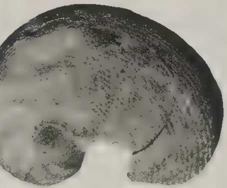

7

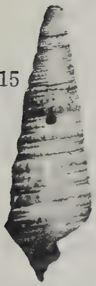

13

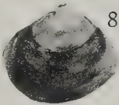

11

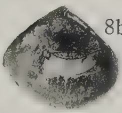

10

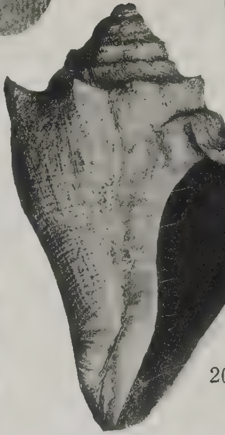

12

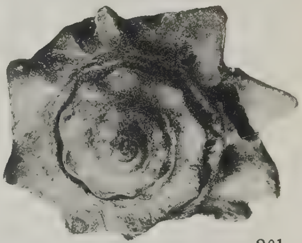

14

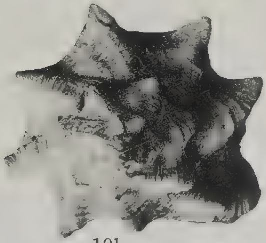

15

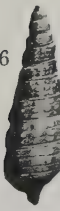

8a

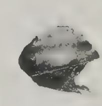

8b

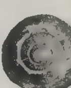

20c

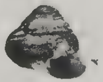

20b

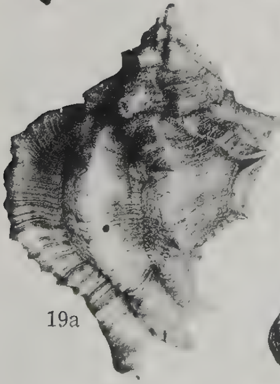

19b

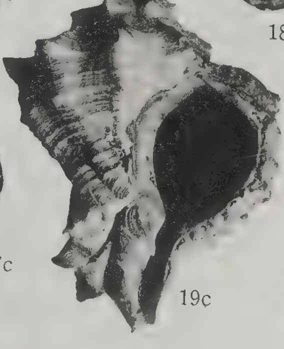

16

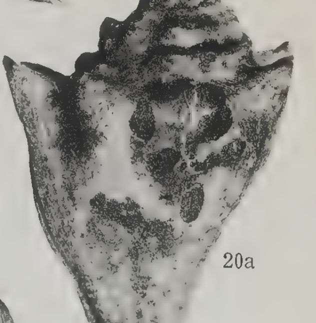

18a

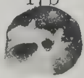

18b

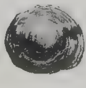

17a

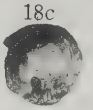

19a


19c


20a


17b


17c


18c

KUMAGAI photo.

Trans. Proc. Palaeont. Soc. Japan, N.S., No. 38, pp. 275-283, pl. 32, June 1, 1960.

# 383. A NOTE ON *NEOBURMESIA*, A PECULIAR JURASSIC PELECYPOD, WITH DESCRIPTION OF MITILIDS AND MYACIDS FROM THE UPPER JURASSIC SOMA GROUP IN JAPAN*

MINORU TAMURA

Faculty of Education, Kumamoto University

福島県相馬ジュラ系産の *Neoburmesia* Yabe and Sato 及び Mytilids, Myacids: 相馬産の鳥巣二枚貝動物群のうち Mytilids 及び Myacids を記載し，併せて *Neoburmesia* Yabe and Sato の性質を検討した。これらの化石は相馬以外の地域ではその産出が殆どなく，Pteriacea の多産と共に他の区域の鳥巣二枚貝動物群に較べて顕著な性質である。又これらの中には北西欧及びヒマラヤ・エチオピヤ区の上部ジュラ系産の数種が含まれている。*Neoburmesia* Yabe and Sato は今回の調査により chondrophore の存在が認められず，*Pholadomya* に近縁なものであることがわかった。

田村　実

*Neoburmesia* from the Nakanosawa formation of the Soma Group is an interesting genus having unusually wide outline. Yabe and Sato (1942) compared it with *Burmesia* Healey (1908) from the Upper Triassic Napeng Beds of Burma, chiefly from external ornaments. Fortunately, the writer succeeded to collect many well-preserved topotypes which admitted him additional observations with which on the taxonomic position of the genus can be discussed.

Beside *Neoburmesia* are described here Mytilids and Myacids from the Nakanosawa formation in which are four distinct fossil zones. Geological notes and the fossil localities were listed elsewhere (Tamura, 1959-b). These fossils and their occurrences are shown in Table 1. Most of them are characteristic in

Table 1. List of the fossils and their range chert.

| Specific name | Nakanosawa formation | | | |
|---|---|---|---|---|
| | 5th zone | 6th zone | 7th zone | 8th zone |
| *Modiolus* cf. *bipartitus* J. Sowerby | × | — | — | — |
| *Modiolus* (*Inoperna*) *plicatus* J. Sowerby | × | — | × | × |
| *Modiolus* (*Inoperna*) sp. | — | — | — | × |
| *Brachidontes* (*Arcomytilus*) *laitmairensis* (de Loriol) | — | — | × | × |
| *Myoconcha* ? sp. | × | — | — | — |
| *Pinna* cf. *mitis* Phillips | — | — | × | × |
| *Pleuromya* ? *punctostriae* Tamura | × | — | — | × |
| *Myopholas* cf. *acuticostata* (J. de C. Sowerby) | × | — | × | — |
| *Pholadomya somensis* Tamura, new species | × | — | — | × |
| *Neoburmesia iwakiensis* Yabe and Sato | — | — | × | × |
| *Homomya gibbosa* (J. Sowerby) | × | — | — | — |
| *Goniomya nonvscripta* Tamura, new species | × | — | — | × |

---

* Received Jan. 30, 1959; read at 72th meeting of the Society at Hiroshima, Feb. 14, 1959.

sandstone facies and widely distributed, not only in South Asia but also in Europe. Such Tethyan similarity, however, cannot be recognized in other pelecypods of Soma. They are mostly long-ranged and invaluable as time indices.

The writer expresses his sincere thanks to Prof. T. KOBAYASHI of the Univ. of Tokyo for his kind guidance through which this study was accomplished.

## Description of Fossils

### Family Mytilidae

### Genus *Modiolus* LAMARCK, 1799

### *Modiolus* cf. *bipartitus* J. SOWERBY

Plate 32, Figures 19, 20

cf. 1818. *Modiola bipartita*, SOWERBY, p. 17, pl. 210, fig. 4.
cf. 1837. *Mytilus bipartita*, GOLDFUSS, p. 176, pl. 131, fig. 3.
cf. 1906. *Modiola tulipaea*, BORISSJAK, p. 24, pl. 1, figs. 3-6.
cf. 1928. *Modiola bipartita*, DOUGLAS and ARKELL, p. 174, pl. 12.
cf. 1929. *Modiola bipartita*, ARKELL, p. 55, pl. 2, figs. 1-4 and text-fig. 8.
? 1931. *Modiola tulipa*, DIAZ-ROMERO, p. 32,, pl. 2, figs. 14, 15.
cf. 1940. *Modiolus* cf. *bipartitus*, COX, p. 67, pl. 5, figs. 11, 12.

Two internal moulds at hand are almost identical with well-known *Modiolus bipartitus*. In the larger left mould (plate 32, fig. 20) a deep sulcus extends from umbo to venter on which it gives cnocavity. These features are, however, more or less exaggerated by deformation. The surface is ornamented by very fine regular concentric growth-lines. The median part of shell is most inflated. The specimens are closer to Cox's Upper Bathonian form of Cutch than SOWERBY's.

*Occurrence*:—5 th zone at Locs. 2, 7.

### Subgenus *Inoperna* CONRAD, 1875

### *Modiolus* (*Inoperna*) *plicatus* J. SOWERBY

Plate 32, Fiuregs 5-8

1819. *Modiola plicata*, SOWERBY, p. 87, pl. 248, fig, 1.
1837. *Mytilus plicatus*, GOLDFUSS, p. 175, pl. 130, fig. 12 a.
1853. *Mytilus Sowerbyana*, MORRIS and LYCETT, pt. 2, p. 36, pl. 4, fig. 1.
1856. *Modiola plicata*, QUENSTEDT, p. 357, pl. 49, fig. 4.
1867. *Modiola Sowerbyana*, LAUBE, p. 28.
1874. *Mytilus perplicatus*, de LORIOL and PIETET, p. 156, pl. 13, figs. 19, 20.
1905. *Modiola plicata*, BENECKE, pt. 4, p. 168. pl. 4, fig. 6.
1906. *Modiola perplicata*, BORISSJAK, p. 30, pl. 2, figs. 6 a, b.
1910. *Modiola plicata*, DACQUÉ, p. 30, pl. 5, fig. 10.
1931. *Modiola perplicata*, DIAZ-ROMERO, p. 29, figs. 11-12.
1936. *Modiolus* (*Pharomytilus*) *plicatus*, COX, p. 13, pl. 1, fig. 21.
1940. *Modiolus* (*Inoperna*) *plicatus*, COX, p. 71, pl. 5, figs. 13, 14.

Although the peculiar ornamentation on the dorsal side is variable among illustrated specimens, they belong to this Upper Bathonian-Kimmeridgian species. Whether it is conspicific with *M.* (*Inoperna*) *perplicatus* (ÉTALLON) is a question as noted by COX (1940). The distinction is in the ribs on dorsal surface which are bifurcate in half-way between dorsal margin and the carina in *perplicatus*. In the Soma form, however, some (fig. 5 etc.) are bifurcated as in *perplicatus* but others as in *plicatus*. These specimens are found together and indistinguishable in most characters. Therefore the writer deemed that *per-*

*plicatus* is synonymous with *plicatus*.

*Occurrence:*—5 th zone at Loc. 7; 7 th zone at Loc. 3; 8 th zone at Loc. 14.

### *Modiolus* (*Inoperna*) sp.

Plate 32, Figure 9

*Description:*—Shell medium (about 40 mm long), moderately inflated, ensiform in shape; dorsal margin a little rounded; ventral slightly concave; both margins nearly parallel in posterior; umbonal carina indistinct; surface ornamented only by growth-lines.

*Observation:*—A left valve at hand may be refered to *Inoperna* by its ensiform shell. The surface is, however, ornamented only by growth-lines and the peculiar ribs of *Inoperna* are absent on the dorsal side.

*Occurrence:*—8 th zone at Loc. 14.

## Genus *Brachidontes* Swainson, 1840

## Subgenus *Arcomytilus* Agassiz, 1842

### *Brachidontes* (*Arcomytilus*) *laitmairensis* (de Loriol)

Plate 32, Figures 3, 4

1853. *Mytilus asper*, Morris, Lycett, p. 39, pl. 4. fig. 8.
1867. *Mytilus* (*Septifer*) *asper*, Laube, p. 30, pl. 2, fig. 5.
1931. *Mytilus laitmairensis*, Diaz-Romero, p. 29, pl. 2, figs. 11 a, b and 12.
1935. *Mytilus* (*Arcomytilus*) *laitmairensis*, Cox, p. 164, pl. 15, figs. 13, 14.
1936. *Mytilus* (*Arcomytilus*) *laitmairensis*, Arkell, p. 359, pl. 53, fig. 2.
1940. *Brachidontes* (*Arcomytilus*) *laitmairensis*, Cox, p. 81, pl. 5, figs. 15–17.

*Description:*—Shell medium for genus, well inflated, cuneiform and widening gradually towards its postero-ventral extremity; umbo terminal; umbonal region produced but not inflated, most convex at a little anterior to midheight; hinge-margin about a half or a little more of the shell lengh, slightly rounded and passing into convex posteri- or and concave ventral margin; umbonal carina or ridge fairly distinct; posterocarinal part depressed; radial ribs numerous, increase their number by divarication.

*Measurement:*—

| | | L | H |
|---|---|---|---|
| Left valve | (MM 3268) | 27. 0 mm | 19. 0 mm |
| L. | (MM 3369) | 28. 0 | 17. 0 |

*Observation:*—Three left valves and a right one are at hand. Among foreign specimens, Diaz-Romero's from Central Dancalia (pl. 2, figs. 11, 12) are closely allied to the Soma form. This species is long-ranged from Bathonian to Argovio-Kimmeridgian. Its descrimination from *B.* (*Arcomytilius*) *asper* (J. Sowerby) is a matter of discussion. The Soma form is especially akin to the typical *laitmairensis*.

*Occurrence:*—7 th zone at Loc. 15 and 8 th zone at Loc. 14.

## Family Modiolopsidae

## Genus *Myoconcha* Sowerby, 1824

### *Myoconcha* ? sp.

Plate 32, Figures 1, 2

*Description:*—Shell medium for genus, fairly convex, much inequilateral, oblong and mytiliform; umbo small and indistinct, subterminal; dorsal margin slightly rounded and passing into rounded posterior; ventral straight; anterior short and rounded; shell body dilated backward; umbonal angulation obscure; surface smooth; anterior adductor scar close to umbo large, trigonal and bounded by a prominent cravicle; hinge unknown.

*Measurement:—*

| | | L | H |
|---|---|---|---|
| Right valve | (MM 3271) | 55 mm | 23 mm |
| R. | (MM 3272) | 26 ? | 11 |

*Observation and Comparison:*—Three internal moulds of right valves and an incomplete external mould of a right valve are refered to *Myoconcha* by a large anterior adductor scar bounded by a prominent cravicle and by a terminal umbo. In outline they somewhat resemble *Mytilus* but tne anterior adductor scar is too large for *Mytilus*. The Soma from is a little different from *Myoconcha* in general shape, though the form has a wide umbonal region and is more or less similar to *M. crassa* Sow. which is the type-species of the genus.

*Occurrence:*—5 th zone at Loc. 7.

## Family Pinnidae

### Genus *Pinna* Linné, 1758

### *Pinna* cf. *mitis* Phillips

Plate 32, Figures 12–14

cf. 1940. *Pinna* cf. *mitis*, Cox, p. 132, pl. 10, fig. 11.

*Description:*—Shell medium for genus (90 mm long and 30 mm high), inflated, wedge-shaped and tetragonal in section; dorsal and ventral margins straight; posterior gaping unknown; median carina distinct and dividing surface into two parts of which ventral one is slightly wider; dorsal half ornamented with about 9 radial riblets and inserted by a few riblets in posterior; ventral half provided with radial riblets (about 4) which are distinct near median carina but obscure and become broad undulations near ventral margin.

*Observation and Comparison:*—Most bivalved specimens lack their umbonal part and posterior. They closely resemble *Pinna* cf. *mitis* Phillips by Cox (1940). Although the original description is inaccessible to the writer, these specimens may be referable to this species.

*Occurrence:*—7 th zone at Loc. 15 and 8 th zone at Loc. 14.

## Family Pleuromyidae

### Genus *Pleuromya* Agassiz, 1845

### *Pleuromya*? *punctostriae* Tamura

Plate 32, Figures 27, 28

1959-a. *Pleuromya*? *punctostriae*, Tamura, p. 117, pl. 12, figs. 29-32.

One external mould of a left valve (fig. 27) and one internal mould of a right valve at hand are both deformed and incomplete. Their regular undulation on surface, however, are characteristic in *punctostriae*. Rows of punctae are invisible in them probably due to their poor preservation.

*Occurrence:*—5 th zone at Loc. 7 and 8 th zone at Loc. 14.

## Family Pholadidae

### Genus *Myopholas* Douvillé, 1907

### *Myopholas* cf. *acuticostata* (J. de C. Sowerby)

Plate 32, Figures 25, 26

cf. 1827. *Pholadomya acuticostata*, J. de C. Sowerby, p. 88, pl. 146, figs. 1, 2?

cf. 1854. *Pholadomya acuticosta*, Morris and Lycett, p. 121, pl. 13, fig. 13.

cf. 1923. *Myopholas Douvillei*, Lissajours, p. 199, pl. 32, figs. 8, 8 a.

*Description:*—Shell large for genus,

well inflated, inequilateral, oblong or subtrigonal and much longer than high; umbo indistinct, incurved and located anteriorly; anterior margin a little concave; posterior margin nearly straight; ventral evenly rounded; anterior part without radials, more or less depressed; no distinct sulcus seen between anterior and middle part; middle and slightly depressed anterior parts radially ribbed; radials coaser in anterior than middle part, coarse but obscure in posterior; growth-lines fairly distinct but weak in region radially ribbed.

*Observation and Comparison:*—Three specimens at hand are probably allied to this species. The radial ribs are about 40 in the left valve and a little less in the right. They are irregularly disposed.

*Occurrence:*—5 th zone at Tochikubo; 7 th zone at Loc. 13 and 15.

### Family Pholadomyidae

### Genus *Pholadomya* Sowerby, 1825

### *Pholadomya somensis* Tamura, new species

Plate 32, Figures 10, 11

1939. *Pholadomya Protei*, Stefanini, p. 263, pls. 27, 28, figs. 6-8.

*Description:*—Shell small to medium, gibbose, a little higher than long, somewhat trigonal and expanding postero-ventrally; umbo subtrigonal, inflated and slightly incurved; anterior margin very short; lunule small, deep and distinct; posterior margin slightly concave and lanceolate; escutcheon well defined; ventral well rounded and demarcated from anterior margin; posterior somewhat truncated and gaping; radial ribs about 7 on middle part; concentric folds or growth-lines fairly distinct.

*Measurement:*—

| | L | H |
|---|---|---|
| Bivalved shell (MM 3278) | 35 mm | 41 mm |
| (MM 3279) | 32 | 40 |
| (MM 3280) | 21 | 28 |
| (MM 3281) | 15 | 18 |

*Observation and Comparison:*—The radial ribs on surface are fairly distinct in some specimens but obscure in others. *Pholadomya protei* (Brongniart) by Stefanini from Somaliland Jurassic has five radial ribs but the shape of a shell (pl. 28, fig. 7 a) closely resembles the Soma form (MM 3279). The original figure of *protei* by Brongniart (1821) is different in shape from that of the Somaliland form.

*Occurrence:*—5 th zone at Loc. 8; 7 th zone at Loc. 15; 8 th zone at Loc. 14.

### Genus *Neoburmesia* Yabe and Sato, 1942

*Type-species:*—*Neoburmesia iwakiensis* Yabe and Sato.

*Diagnosis:*—Shell large, very inequilateral, equivalve, inflated, somewhat *Parallelodon*-like or elongate *Pholadomya*-shaped; umbo much anterior; surface divided into three parts by strong posterior carina and weak anterior carina; anterior and posterior parts depressed, covered with weak concentric ribs; median part with distinct radial and concentric ribs, tuberculate at their junction; escutcheon long, narrow and well defined; posterior gaping distinct; hinge edentulous.

*Remarks:*—Yabe and Sato (1942) founded the genus on *Neoburmesia iwakiensis* Yabe and Sato from the Koike limestone near Koike, which is monotypic. The presence of chondrophore was a question. From the similarlity of external ornaments they compared the genus to *Burmesia* Healey (1908) from the Triassic Napeng beds of Burma. It has a chondrophore. Together with *Prolaria* Hea-

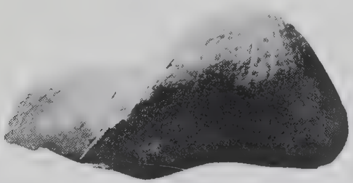
LEY she placed it in the Burmesiidae and considered *Anatina* and *Pholadomya* as its close relatives.

Although it resembles *Burmesia* in ornaments, it is evidently different from *Burmesia* in the inflated and elongated shell, very anterior umbo, distinct posterior gaping. It agrees with *Pholadomya* better than *Burmesia.* The absence of the chondrophore is, however, ascertained by cutting the umbo longitudinally as well as transversely. This point is, further, confirmed by the elevated and strongly incurved umbo.

In the elongate forms, such as *Pholadomya gigantea* (Sow.) (Woods, 1909), *P. arcuata* Ag., *P. nympheacea* Ag., *P. pantica* Ag., *P. Bucardium* Ag. (Agassiz, 1840) and *P. eleganta* Münster (d'Orbigny, 1843–47), are they very similar to the type-species. This resemblance of shell form is a proof for the close relation between the two genera. But the distinct posterior carina, strongly inflated and incurved umbo and well developed posterior part are the distinction of this genus from these elongated *Pholadomyas.* Its very low shape is also characteristic.

In the writer's opinion *Pholadomya* is probably more numerous in Cretaceous than Jurassic. Likewise, *Neoburmesia* is presumed to have derived from *Pholadomya* by elongation of shell. Yabe and Sato did not cite its taxonomic position but the writer places it in the Pholadomyidae.

*Distribution* :—Upper Jurassic in Japan.



Text-fig. 1. *Neoburmesia iwakiensis* Yabe and Sato ; ×1/2 (internal mould of a right valve)

### *Neoburmesia iwakiensis* Yabe and Sato

Plate 32, Figures 21–24 ; text-figure 1

1942. *Neoburmesia iwakiensis,* Yabe and Sato, p. 251, text-figs. 1–3.

*Description* :—Shell large, equivalve, strongly inequilateral, well inflated, much elongated and somewhat *Parallelodon*-like ; umbo at about 1/5 or less of the length from anterior, inflated, strongly incurved and orthogyrous ; antero-dorsal margin short and inseparable from rounded anterior ; posterior dorsal nearly straight or a little concave and long ; posterior rounded and produced ; ventral nearly parallel to dorsal margin but slightly sinuate below umbo ; posterior umbonal carina strong ; anterior umbonal carina obscure ; anterior part depressed, ornamented by only concentric growth-lines ; median part widely depressed and concave, ornamented by about 20 or more radial ribs ; posterior part elongated, concaved and ornamented only by concentric growth-lines, but faint radial ribs visible near umbo, one long ridge close and nearly parallel to hinge bounding lanceolate shallow escutcheon ; upper half of posterior margin widely gaping ; hinge edentulous.

*Measurement* :—

| | | L | H | W |
|---|---|---|---|---|
| | | mm | mm | mm |
| Bivalved shell | (MM 3282) | 79 | 24 | 22 |
| | (MM 3283) | 98 | 47 | 21 |
| | (MM 3284) | 78 | 23 | 25 |

*Occurrence* :—7 th zone at Locs. 13, 15 and 8 th zone at Locs. 6 and 14.

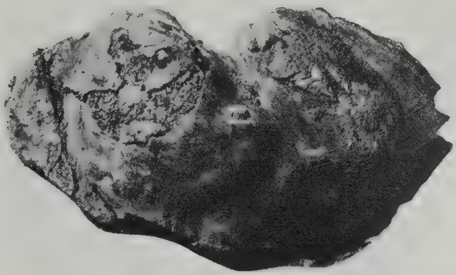
## Genus *Homomya* Agassiz, 1842

### *Homomya gibbosa* (J. Sowerby)

Text-figure 2

1855. *Myacites gibbosa* (Sow.), Morris and Lycett, p. 138, pl. 12, fig. 14.

1855. *Myacites Vezelayi* (Lajoye), Morris and Lycett, p. 111, pl. 11, figs. 5, 5 a.
1863. *Homomya gibbosa*, Lycett, p. 88, pl. 43, figs. 2, 2 a.
1935. *Homomya Vezelayi* (d'Archiac), Arkell, p. 338, pl. 49. fig. 1.
1935. *Homomya gibbosa*, Arkel, p. 340, pl. 49, fig. 3.
1948. *Homomya gibbosa*, (Cox and Arkell, p. 44.



Text-fig. 2. *Homomya gibbosa* (J. Sowerby); ×1/2 (internal mould of a left valve)

A large internal mould of a bivalved ahell (L: 115 mm, H: 75 mm, W: 28 mm) from *Lima* sandstone is in the collection. Although its umbo and antero-ventral parts are unpreserved, it is identified with this well known species. In the well inflated shell, strongly convex ventral margin, a fairly concave postero-dorsal margin, a obliquely truncated posterior margin and a posterior gaping it is similar to the type-specimen (J. Sowerby, 1823 and Arkell, 1935). It is long-ranged in England from Inferior Oolite to Corallian.

*Occurrence:*—5 th zone at Kozawa (?).

### Genus *Goniomya* Agassiz, 1842

### *Goniomya nonvscripta* Tamura, new species

Plate 32, Figures 15-18

1959-a. *Goniomya* sp., Tamura, p. 120 pl. 12, fig. 28.

*Description:*—Shell medium-sized for genus, moderately convex, inequilateral, elongate trapeziform; umbo submedian or slightly anterior, indistinct and incurved; dorsal and ventral subparallel and long; postero-dorsal concave near umbo; ventral slightly rounded; anterior margin rounded, upper half most produced; posterior margin straight and diagonal; posterior gaping distinct; ribs about 30, not v-shaped and divided into three sets; anterior and posterior sets fading away near dorsal margin and do not meet directly at points but always joined by fairly long bars of horizontal set; about 6 ribs near venter inseparable into three sets and not angulate at their junctions; growth-lines concentric and very fine.

*Measurement:*—

| | | L | H |
|---|---|---|---|
| Right valve | (MM 3289) | 39 mm | 22 mm |
| R. | (MM 3290) | 44 | 24 |
| R. | (MM 3291) | 35 | 22 |
| L. | (MM 3292) | 42 | 24 |
| L. | (MM 3293) | 43 | 21 |
| L. | (MM 3294) | 35 | 20 |

*Observation and Comparison:*—Several valves and moulds at hand bear characteristic ornaments of *Goniomya*. Their ribs are not strictly v-shaped and always intervented by horizontal fairly long bars. Three sets of ribs are inseparable on ventral side. No anterior and posterior sets intersect the ventral margin. The mode of ornamentation is characteristic of this species. The ribs of three sets are different in number and most of them discontinuous. The posterior gaping is wide.

*Goniomya literata* from the Great Oolite in England resembles this species but its horizontal bars are very short. In typical *G. literata* (J. Sowerby, 1864; Arkell, 1934), horizontal bars are restricted in the umbonal part. *G. inflata*

AGASSIZ (1840) from the Oxfordian of France is close to it in form and ornaments, although the ventral side is probably lacking. The obliquity of ornaments which is here shown by the angle between ventral margin and the line running from the umbo to centers of horizontal bars is larger in *inflata* (80°) than in this species (65°).

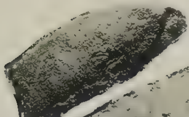
Whether the fragments of *Goniomya* from the Sakamoto formation (TAMURA, 1959-a) belong to this species or not is a difficult problem, though they show a part of ornament. Here the writer, however, refered them to *G. nonvscripta.*

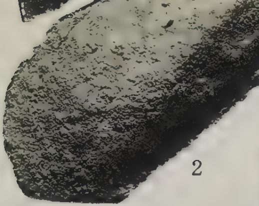
*Occurrence:*—5 th zone at Loc. 8; 8 th zone at Loc. 14; 7 th zone at Loc. 15.

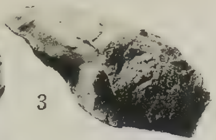
## Explanation of Plate 32

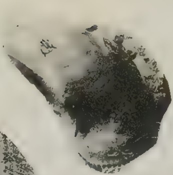
*Myoconcha* ? sp.
  Figs. 1, 2. Internal moulds of left valves; ×1; Loc. 7. (MM 3272, 3271).
*Brachidontes* (*Arcomytilus*) *laitmairensis* (de LORIOL)
  Fig. 3. Left valve; ×1; Loc. 14. (MM 3268).
  Fig. 4. Internal mould of left valve; ×1; Loc. 15. (MM 3269).
*Modiolus* (*Inoperna*) *plicatus* J. SOWERBY
  Fig. 5. Internal mould of a bivalved shell; ×1; Loc. 3. (MM 3263).
  Fig. 6. Internal mould of a right valve; Loc. 8. (MM 3264).
  Fig. 7. A broken left valve; ×1; Loc. 14. (MM 3265).
  Fig. 8. Internal mould of a broken left valve; ×1; Loc. 3. (MM 3266).
*Modiolus* (*Inoperna*) sp.
  Fig. 9. Left valve; ×1; Loc. 14. (MM 3267).
*Pholadomya somensis* TAMURA, new species
  Figs. 10, 11. Internal mould of a right valve of a bivalved shell; ×1; Loc. 8. (MM 3278: holotype).
*Pinna* cf. *mitis* PHILLIPS
  Fig, 12. Dorsal side of a bivalved shell; ×1; Loc. 15. (MM 3273).
  Figs. 13, 14. Ventral side and right valve of a bivalved shell; ×1; Loc. 15. (MM 3274).
*Goniomya nonvscripta* TAMURA, new species
  Figs. 15, 17. Internal moulds of left valves; ×1; Loc. 8. (MM 3294, 3293).
  Fig. 16. Holotype left valve; ×1; Loc. 15. (MM 3292).
  Fig. 18. Right valve; ×1; Loc. 15. (MM 3291).
*Modiolus* cf. *bipartitus* J. SOWERBY
  Fig. 19. Internal mould of a right valve; ×1; Loc. 8. (MM 3261).
  Fig. 20. Internal mould of a right valve; ×1; Loc. 2. (MM 3262).
*Neoburmesia iwakiensis* YABE and SATO
  Figs. 21-24. Upper, side, under and anterior views of a bivalved shell; ×1; Loc. 15. (MM 3282).
*Myopholas* cf. *acuticostata* (J. de C. SOWERBY)
  Fig. 25. Internal mold of a left valve of a bivalved shell; ×1; Loc. Tochikubo. (MM 3295).
  Fig. 26. Internal mould of right valve; ×1; Loc. 3. (MM 3296).
*Pleuromya* ? *punctostriae* TAMURA
  Fig. 27. Clay cast of an external mould of a left valve; ×1. Loc. 7. (MM 3276).
  Fig. 28. Internal mould of a right valve; ×1; Loc. 14. (MM 3277).

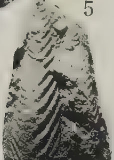
All specimens here illustrated are kept ih Geological Institute, University of Tokyo.

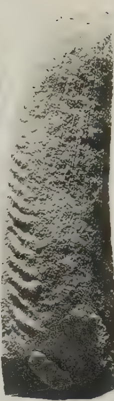

1

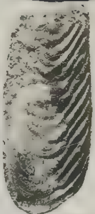

2

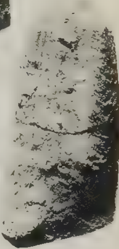

3

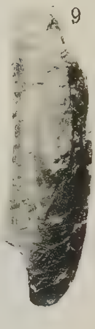

4

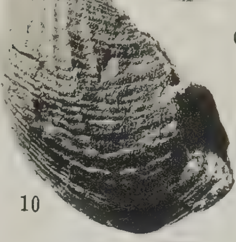

5

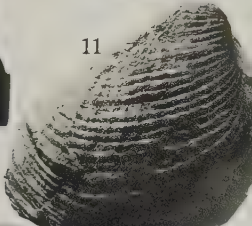

6

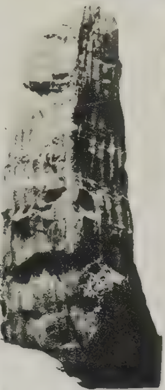

7

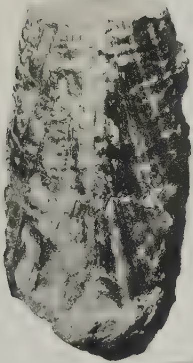

8

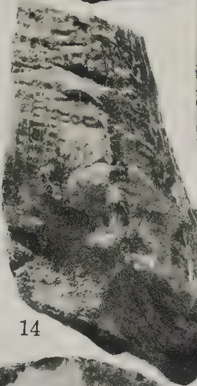

9

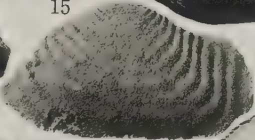

10

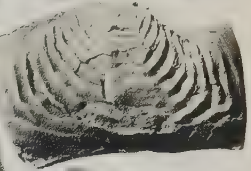

11

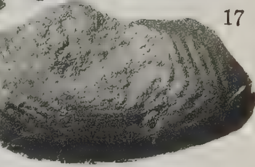

12

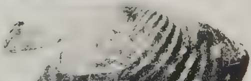

13

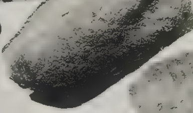

14

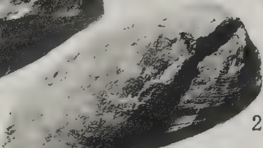

15

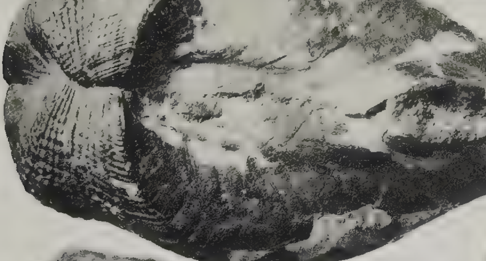

16

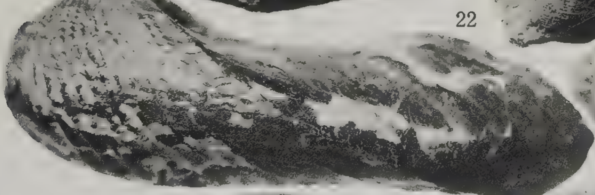

17

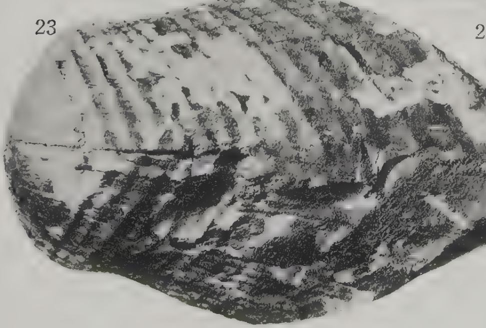

18

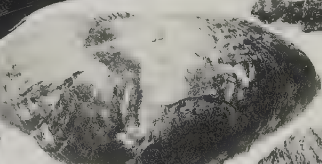

19

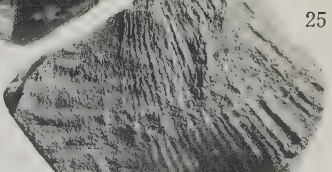

20

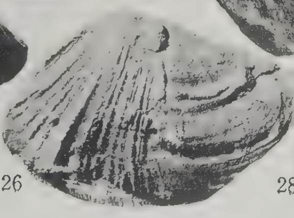

21

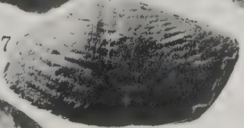

22

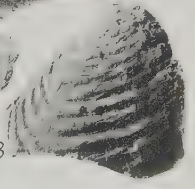

23


24


25


26


27


28

## References cited

AGASSIZ, L. (1842-5), Études critiques sur less mollusques fossils. Monographile des Myes.

BENECKE, E. W. (1905), Versteinerungen der Eisenerzformation von Deutsch-Lothringen und Luxenburg. *Abh. Geol. Spezialk. Elsaas-Lothringen. N. S., Pt. 6.*

BORISSJAK, A. (1906), Die Pelecypoden der Jura-Ablagerungen im europaeishen Russland. 3 Mytilidae. *Mém. Com. géol. St. Pétersbourg, N. S. Livr. 11.*

BRONGNIART, A. (1821), Retigured, 1910, Palaeot. Universalis, *No. 174.*

COX, L. R. (1935), Jurassic Gastropoda and Lamellibranchia. In the Mesozic Palaeontology of British Somaliland.

—— (1936), Fossil Mollusca from Southern Persia (Iran) and Bahren Island. *Pal. Indica, N. S. Vol. 22, Mem. No. 2.*

—— (1940), The Jurassic Lamellibranch Fauna of Kuchh (Cutch). No. 2. *Pal. Indica. Ser. 9, Vol. 3, Pt. 3.*

DACQUÉ, E. (1910), Dogger und Malmaus Ostafrika. *Beit. Pal. u Geol. Österr-Ungarns, Vol. 23.*

DIAZ-ROMERO, V. (1931), Contributo allo studio della fauna giurese della Dancalia. *Pal. Ital., Vol. 31.*

DOUGLAS, J. A. and ARKELL, W. J. (1928), The Stratigraphical Distribution of the Cornbrash. Pt. 1: The South-Western Area. *Q. J. G. S., Vol. 84.*

GOLDFUSS, A. (1833-40), Petrefacta Germaniae.

HEALEY, M. (1908), The Fauna of the Napeng Beds of the Rhaetic Beds of Upper Burma. *Pal. Indica, N. S. Vol. 2, Mem. No. 4.*

LAUBE, G. C. (1867), Die Bivalven des braunen Jura von Balin. *Denkschr. Akad. Wiss. Wien, Vol. 27, Pt. 2.*

LISSAJOUS, M. (1923), Étude sur la faune de Bathonien des environs de Mâcon. *Trav. Lab. Géol. Fac. Sci. Lyon. Mém. 3.*

LORIOL, P. et PELLET, E. (1874-75), Monographie Paléontologique et Géologique des Étage Supérieurs de la Formation Jurassique des Environs de Boulogne-sur-Mer. *Mém. Soc. Phys. d'Hist. Nat. Genève Tm. 24, Premiere Partie.*

LYCETT, J. (1863), Supplementary Monograph on the Mollusca from the Great Oolite chiefly Minchinhamptom and the coast of Yorkshire. *Pal. Soc. London.*

d'ORBIGNY, A. (1843-1847), Description des Mollusques et Rayonnés Fossiles. *Pal. France Terr. Crét., Tm. 3.*

QUENSTEDT, F. A. (1856-8), Der Jura.

SOWERBY, J. and J. de C. (1812-46), Mineral conchology of Great Britain. *Vols. 1-7.*

STEFANINI, G. (1938), Palaeontologia Della Somalia. Fossil del Giurlias. *Pal. Italica, Vol. 32, Sup. 3.*

TAMURA, M. (1959-a), Some Pelecypods from the Upper Jurassic Sakamoto formation in Central Kyusyu, Japan. *Trans. Proc. Pal. Soc. Japan, N. S., No. 35.*

See also ARKELL, W. J. (1929-37), COX, L. R. and ARKELL, W. J. (1948), MORRIS, J. and LYCETT, J. (1853-55), TAMURA, (1959) and YABE, H. and SATO, S. (1942) in *Trans. Proc. Pal. Soc. Japan, N. S., No. 36*, p. 179.

Trans. Proc. Palaeont. Soc. Japan, N.S., No. 38, p. 284, June 1, 1960

# SHORT NOTES

## 6. TWO JURASSIC PELECYPODS FROM WEST THAILAND

ITARU HAYAMI

Geological Institute, University of Tokyo

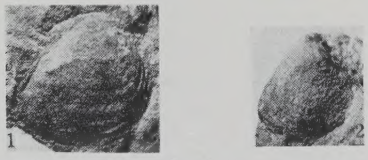
The specimens dealt here with were donated to Prof. KOBAYASHI by Mr. Saman BURAVAS, chief of the Geological Survey Division, Royal Department of Mines, Bangkok, Thailand. For the privilege of studying them, I thank them sincerely.

### *Eomiodon chumphonensis* HAYAMI, n. sp.

Text-figures 1, 2

*Description:—* Shell small, trigonally ovate, not carinated, nearly as long as high, moderately inflated (holotype, MM 3632, 12.5 mm. long; 12.0 mm. high; 3.0 mm. thick); antero-dorsal margin short; postero-dorsal long, slightly convex; umbo prosogyrous, lying at about a third of length from front; escutcheon narrow but distinct; posterior lateral tooth PI stout, elongated along posterior half of postero-dorsal margin; PIII apparently absent; surface marked with somewhat rugose growth-lines; inner ventral margin smooth.

*Observation and comparison:—* Two right internal moulds are at hand. A posterior lateral tooth is clearly impressed on the holotype. Surface concentrics appear more sparce and stronger in the holotype than the paratype, but the difference probably does not serve specific distinction. The elongated PI, rugose surface, smooth ventral margin, not excavated pre-umbonal margin and general outline suggest *Eomiodon* COX, 1935, instead of *Astarte*. It resembles *Eomiodon fimbriatus* (LYCETT, 1863) from the European Bathonian and *E. vulgaris* HAYAMI, 1957, from the Japanese Lias-Dogger. However, it differs from the two in the more trigonal outline. *E. indicus* COX, 1935, from the Bathonian of Attock and *E. namyauensis* REED, 1936, from the middle Jurassic of Burma have more salient beaks and larger dimensions.



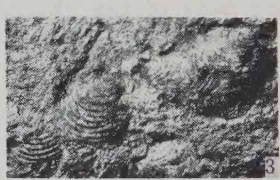
Text-figures 1, 2. *Eomiodon chumphonensis*, n. sp. 1. holotype, ×1.5. 2. paratype, ×1.5.

*Occurrence:—* Argillaceous sandstone at the mouth of Chumphon River, Krah Isthmus, Southwest Thailand. This may be a Jurassic species.

### *Posidonia* sp. ex gr. *ornati* QUENSTEDT

Text-figure 3

Many specimens adhering to two slabs are similar to *Posidonia ornati* QUENSTEDT, 1851 though specifically indeterminable. Black impure limestone at Hin Fon stream, Mae Sot Basin, Tak, West Thailand. *Tmetoceras* was found nearby, and the age is probably Aalenian.



Text-figure 3. *Posidonia* sp. ex gr. *ornati* QUENSTEDT, ×1.5.

|  | 開催地 | 開催日 | 講演申込締切日 |
|---|---|---|---|
| 第76回例会 | 島根大学 | 1960年9月24日 | 1960年9月5日 |
| 第77回例会 | 名古屋大学 | 1960年11月19日 | 1960年10月30日 |

## 会員消息

会員湊 正雄君は Sweden, Stockholm 大学, Geologiska Institutet 其の他での在外研究を終え本年4月中旬帰国した。

会員槇山次郎・西田彰一両君は地盤沈下視察のため本年4月中旬アメリカ合衆国へ出発した。

## News

本年8月 Copenhagen で開催される第21回国際地質学学会議の会期中には次の議題の国際古生物学連合の会合及び次の国際地質学会議の Commissions の会合が予定されている。

◎ International Palaeontological Union
  1. Palaeoecology: Calcareous Algae
  2. Primitive Tetrapods and their passage to terrestrial life
  3. Invertebrates: Passage forms and primitive phyla
  4. Miscellaneous

◎ Commissions of the Congress
  1. International Commission on Stratigraphy
     a. Subcommission on the Stratigraphic Lexicon
     b. Subcommission on Stratigraphic Terminology
     c. Subcommission on Carboniferous Stratigraphy
     d. Subcommission on Quaternary Stratigraphy
     e. Committee on the terminology of the Silurian and Ordovician
     f. Committee on the Mediterranean Neogene
  2. Commission on the Geologic Map of Europe
  3. Commission on the Geologic Map of the World
     a. Subcommission on the International Tectonic Map
     b. Subcommission on the International Metalogenetic Map
  4. Commission on Gondwana
  5. Commission on Meteorites
  6. Commission for the formation of an International Geological Abstracting Service

購読御希望の方は本会宛御申込下さい

---

1960年5月25日　印刷
1960年6月1日　発行

日本古生物学会報告・紀事
新篇第38号
250円

東京大学理学部地質学教室内
日本古生物学会

編集者　高井冬二
発行者　市川健雄
（振替口座東京84780番）
印刷者　東京都港区芝片門前2ノ13
学術図書印刷株式会社　富田元

# 日本古生物学会報告紀事出版規定

(1958年12月6日改正)

## I. 投稿規定

1. 原稿は日本古生物学会の年会または例会において講演（代読を認める）したものに限る。
2. 原稿は欧文に限り，タイプライター用紙（22.5×27.5 cm）に1行おきに明瞭にタイプライトし，学名はイタリックに著者自身指定する。
3. 原稿（挿図・地図・付表を含む）は8印刷頁（タイプライター用紙約18枚）を限度とする。
4. 図版（14.2×20.0 cm）は1枚まで掲載出来る。
5. 挿図（6坪以下のもの2個；1坪は1寸平方）は白紙に墨または製図用黒インクにて明瞭に書き，図中の字はなるべく活字又はタイプライター字をはりつける。印刷に際して縮図することがあるから，線の太さ，字の大きさなどはこの点を充分に考えに入れて書く必要がある。
6. 地図には必ず縮尺をつける。縮尺何分の1としたものはいけない。
7. 以上の限度を超える場合は著者がその費用を負担する。
8. 原稿には邦文表題と簡単な邦文要約を付記する。
9. 引用文献はすべての文の最後に文献の項を設けてそこに一括する。文献は著者名のアルファベット順に配列し，同一著者の論文は発表年代順とする。著者名・発表年・論文表題・雑誌名・巻・頁・図版・挿図・地図・付表等を正確に記入する。
10. 原稿には著者名の次に現在の所属機関名を付記する。
11. 1印刷頁以内の短報（挿図・地図・付表を含む）は余白あり次第，受理日付の順に掲載する。
12. 別刷の必要部数を原稿に付記する。但し無表紙100部までは無償で，それ以上は著者がその費用を負担する。
13. 原稿は著者の責任において外人または適当と認められる人に見て貰う。

## II. 編集規定

1. 編集委員は原稿の受理・保管・編集を行う。
2. 編集委員は原稿を受理した場合，その原稿が鮮明であり且つ其の他形式上の不備の無いことを確認した上で直ちに受理日付を記入し，著者には保管証を送る。
3. 原稿の採用不採用は会長と常務委員との合議により決定する。
4. 編集委員は不採用原稿を不採用の理由を付記して著者に返却する。
5. 編集委員は採用原稿を出版費に応じて，受理日付の順に掲載する。
6. 著者が編集前に論文内容を訂正した場合には受理日付を変更する。
7. 印刷の体裁は大略 Journal of Paleontology の体裁に準ずる。
8. 校正は出版委員の責任においてこれを行う。